

Oral histories of early American biologists in Antarctica: Gerald Kooyman, John Pearce, Jack Littlepage, Paul Dayton, & Gordon Robilliard

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Oral History of Gerald Kooyman

PAUL DAYTON: It's January 23, 2012 and this is Paul Dayton, and I'm trying to get Gerald Kooyman's memories, and probably I will talk more than he does because I'm so excited about it all.

GERALD KOOYMAN: I'm Jerry Kooyman, and I am looking forward to the questions that Paul asks and setting the record straight.

PAUL DAYTON: Anyway, this is the first oral history of early American Biologists in the Antarctic. I have found a couple other sets of oral histories, one conducted by an early helo pilot who is a good guy but focused on military personnel rather than scientists and another set at Ohio State that seems to exclude biologists. It is almost as though George Llano's legacy has been carefully excluded.

GERALD KOOYMAN: Oh, is that right? Well, probably so. Most of their record would be glaciologists or geologists.

PAUL DAYTON: They were very hostile to Llano, so I wanted to get the Stanford perspective of the early '60s, because I don't think it's otherwise ever going to show up.

GERALD KOOYMAN: That would probably be true to some degree. And that is really kind of sad, too. George Llano, he was a botanist and he was, what do they call him? A cryptologist and he was kind of a protégé of Scholander. Scholander had an effect on many people in a very broad spectrum, because Scholander got his PhD in cryptology. And then they were associates at Harvard, and somehow -- and I think Scholander played a role in George getting the job as program manager. And in those days, and you know that too, that in those days program manager was the end-all. He ruled. They didn't do it like the rest of NSF. Pretty much the program manager made the decisions, I think. He got advice from other people, but he made the decisions as to who was going to get funded and who wasn't going to get funded. And so George did it in a, I thought, a pretty effective way because he had a lot of successes. He made a lot of enemies too, and that was the problem, I guess, in the end, especially within the organization. Because he would do things that were probably borderline as far as government work is concerned and all. But he got things done, and I'm an advocate of him because he got me started as far as funding in the Antarctic. He was very enthusiastic about certain things, and when he got enthusiastic about them he would really help you out. And he liked what I was going to do at that time.

PAUL DAYTON: Yeah, I mean this was one of the things I was going to start off with, is that given your memory of the relationship of George Llano and Donald 'Curly' Wohlschlag and Tommy, who ran the lab -- do you want to offer that?

GERALD KOOYMAN: I probably could. It would be censored to some degree. I mean, Curly and George, the best I could tell, is they sort of had a love-hate relationship. He did the funding for Curly and Curly had great largess there as far as he

had all the money to run the bio lab as well as his own programs. And they were sort of separate, but not completely separate. So Curly was a big deal down there, he had a lot of money. And George overlooked that, but sometimes he didn't like the way he was doing it.

I know where Tommy came from, I don't know how Curly hired him. But Tommy was a retired Navy guy, and he was really a rather despicable character, if you want my assessment of him.

PAUL DAYTON: It was F.J. Thomas.

GERALD KOOYMAN: Yes, he was a retired Navy chief or something like that. And he treated all of us like we were underling enlisted men for him and all of that. And I came out of the Navy and then went into this program not long after that. And the Navy really ruled down there at the time with NSF being sort of a side arm to get it going. But because of my experience in the Navy, I had a sense of how they did things and how you make things work when you work with the Navy. And my three years in the Navy really served me well for working in the Antarctic. But Tommy was one of those guys that was just, to me, shouldn't have been in the position he was in.

PAUL DAYTON: Just let me clarify a little bit. When Jerry is speaking of running the lab, Curly Donald E. Wohlschlag, had two programs. One, his own science program, and the other one -- he was responsible for establishing and running the bio lab. And he gave that chore to F.J. Thomas who was more of a bookkeeper and a martinet. And overstepped his bounds all the time. But at the same time, the lab was running pretty well. They got the equipment. You'd have to suffer Tommy, but the equipment would come.

And Llano set that up in the early -- in the late '50s so that Llano could get the lab going. And he got Curly to be this sort of front person. So this was sort of the way the logistics of the bio lab got started, it was Llano very much involved telling Curly, you know, what to buy. And telling Curly to buy all of those Discovery reports and all that early Antarctic literature that they had in the bio lab from the beginning. And that was there because of Llano's personal insight and wisdom.

GERALD KOOYMAN: Yes, well, Llano, I don't know if that's how he got started with it, but he was an avid collector of polar books. He had a huge collection -- I went with him to a bookstore one time to buy some books, and he went out with a stack of books that I couldn't believe. And he had a lot of first editions and everything. And in the end, he sold it all to somebody, a library or a collector in England. And got something like 100 grand for it, to give you an idea. And then he -- typical Llano, then he boxed it up in cardboard boxes, taped it all together, and mailed it to this person, whoever it was.

PAUL DAYTON: And so I am hoping to just get independent view -- I think Llano was one of the more important science people in the Antarctic because of the way he helped people like you.

GERALD KOOYMAN: Well, yes, as I say, I'm an advocate of him. And he went on until -- I don't know whether -- he was forced into retirement, but he went until the mid '70s.

PAUL DAYTON: Yes, he was really sort of heavy-handedly forced into retirement.

GERALD KOOYMAN: Yes. But he got his sweet revenge, you might say, because he got the sweetest retirement job you could ever ask for. He ended up being the director or the cruise organizer or whatever you would want to call him for Lindblad Explorers. And he just picked and chose places around the world that he had never been or wanted to go to or all of that, and organized a cruise to go there. So for the next 10 or 20 years he went everywhere in the world on those cruises.

PAUL DAYTON: I have a memory that I can record, but why don't you -- of how you met Curly. How you went to the Antarctic in the first place. And how you interacted with the Stanford guys before you went down.

GERALD KOOYMAN: It would have been more after. By the time I got over to Stanford, all of those guys was gone. They were down on the ice already.

PAUL DAYTON: When you were at Berkeley, how did you come to be interested in the Antarctic?

GERALD KOOYMAN: I was at Berkeley in a graduate program there, and I was casting about for a thesis to do. And the guy that I thought I was going to do my work under actually didn't take students. I didn't know a thing about graduate school or anything, I just arrived. I was just fresh out of the Navy, I worked for Fish and Game that summer, and then I went over to Berkeley, and I started graduate school there. And I was really uneasy about it. There were 200 graduate students, which was huge, in my view. And that was in the Department of Zoology at the time. So I was kind of overwhelmed with that as well.

And I had a really good friend there, Verne Peckham, who was not in school there, but we hooked up, actually, through a church connection. So Verne taught me how to dive in Monterey. So we chased around a lot together, and then he got this job with Curly as the bio lab manager. And he told me that Curly was looking for -- he said the Stanford professor is looking for a couple of technicians to go down. Boy, this is going to be a real opportunity possibly.

PAUL DAYTON: This was in the summer of '61?

GERALD KOOYMAN: Yes, had to be, probably the Spring. So I went and interviewed and got the job. And it turned out this farmboy from Montana got the other technician job. And that was Art DeVries. So I took that job, but I didn't start it -- I don't

think I went over to Stanford much at all until we got ready to go. And then I think I left from Travis Air Force Base at that time.

PAUL DAYTON: From Alameda maybe.

GERALD KOOYMAN: No, I'm pretty sure it was Travis. I flew out on a -- I don't know if it was the same plane we went all the way down on, probably not. It was probably a Super Connie out of there. But a guy that was my roommate at Travis just for the night was historic -- it was Ed Thiell. Do you know who Ed Thiell is?

PAUL DAYTON: Yes.

GERALD KOOYMAN: Ed Thiel has a whole mountain range named after him in the Antarctic now. But he was killed that year in the Antarctic. So I knew him that time, didn't see him again, and then got it on the news over at the base or something, that he was killed in an air crash as they were taking off from some -- the Russian base or somewhere in a Navy airplane. I don't know, had an engine failure or something. (Dayton added later: it was Wilkes Station and the jato caught the PV2 on fire as it was taking off)

Anyway, so that was the beginning of my experience with a list of people who have got killed in airplanes down in the Antarctic.

So I didn't meet Art until we arrived at Hickham, and then Art had flown from somewhere else. And we hooked up at Hickham and then went on down to Christchurch, and from Christchurch we stayed at the Gainsborough Hotel for one time, and then another night we stayed somewhere else. This was Christchurch in the early days when they were driving all these old model cars and everything. They were more British than the British were. And I thought that was pretty funny.

So we got a C-119 flight down, it was a boxcar, it took 11 hours to get to McMurdo. And it was slow and big and there was hardly anything in it, and I remember looking out and it was mainly cloud, overcast, but seeing the Antarctic for the first time, all this ice and black rock and all that was pretty thrilling. But when we landed, that was novel. They popped open the back gate to unload and it snowed inside of that 119. It was so big, and it had a lot of air there, warm --

PAUL DAYTON: That's the old Strata cruiser. It was huge.

GERALD KOOYMAN: Yes, they don't use them anymore?

MALE VOICE: This was in the fall of 1961?

GERALD KOOYMAN: Yes, yes. And we had gone down earlier, we were there by early October. Well, the arrival was really something else compared to what it is now. We arrived, and just Art and I on that, so we put our clothes on before we got off the

plane. And Phil Smith, who was the NSF rep at that time and running that part of the show arrived in a power wagon, picked us up and drove us into town. And I think he briefly showed us around a little bit at the base, which looked like just an old mining town. And then he took us to our quarters which was a canvas Jamesway, nobody there yet, and handed us both a shovel. And we went in there, and it was colder than the dickens in there. And it had a leak from the canvas, and there was a lot of snow inside. We had to dig that snow out. And then I don't know how we got the fire started in the preway, but it wasn't easy. And then we got some nails and nailed down that canvas so it would stop leaking snow. And that was the beginning.

And it turned into an awful place, because by the time -- as the season progressed, there had to be something like 30 guys in there. And the preway was all at one end of this long building, and if you slept on the bottom you were freezing, and if you slept on the upper bunk you were overheated. And then guys on the lower bunks would come in later and turn the heat up. And it was back and forth. So as soon as I could, which took a month anyway, we found an old hut and got permission to convert it into a sleeping quarters and moved into that and got out of there.

PAUL DAYTON: That's interesting, because in '63 I was in the same thing. It was J-3 as I recall. I had to shovel my bunk that was by the leaky door and often all covered with snow.

GERALD KOOYMAN: By that time I don't know where I had moved up, I don't know where I was staying. Oh, I know where I was staying a lot during that time. In the bio lab there was -- you know that cubbyhole that was in the back of the storeroom part? Well, if somebody else wasn't in there, I'd sleep back there.

PAUL DAYTON: We all did. Yes, I stayed in that Jamesway all summer, and when I wintered over and people left, the whole building went away, and I got in a real bed.

GERALD KOOYMAN: Yes. I slept out in -- well, in '63 I got a hut to set up out there, and I stayed in the hut a lot too. It wasn't far off shore, and I had a snowmobile to myself, and I was living alone.

PAUL DAYTON: Why don't you go ahead and tell us what you did with Curly, just briefly. Because I was interested in your interactions with Art and [INAUDIBLE] would cut holes, and seals and --

GERALD KOOYMAN: Mouse, he was my great protector in this thing.

As I say, I left Berkeley and I wasn't sure whether I was going to go back to Berkeley or not. But I was looking for a thesis. And not long after I was there, a short time later I went out on a road trip out on the ice for some reason with John Dearborn. And when we were coming back, he said hey, there is a Weddell seal over here, and he said let's go over and I'll show you a Weddell seal. And I went over and I couldn't believe it, because the animal was like a lot of island animals and all of that, you know, they are

just insensitive to people. Just rolled over little bit and sort of had a look, but it was near an ice hole. And there it was, there was a Weddell seal and there was an ice hole, and nobody was working on these seals at this time except for the Kiwis who were shooting them, and they were doing mostly metrics and all of that on the carcasses. And right there an idea just started to gel.

So it was fortunate in one respect that I didn't get fired right away, because I started horsing around with the seals a lot. And spending time out at one of the huts, because they would come up in these holes that were cut to put traps down for fish, they would come up in those holes so you could watch them. And they would just hang there while they were ventilating. And I even got volunteers to go out after work one night, and everybody went to a different hole. I was trying to figure out how long they were diving for and that sort of thing. So it was gelling as far as that was concerned.

So to make a long story short on that, that pretty much preoccupied me a lot while we were doing the fish work in our spare time. And the bit that I don't have any recollection of, and I haven't looked at some notes -- it might show that -- but I vaguely remember a conversation with Art before I left and he was overwintering, about a depth recorder to put on seals. And I said yes, it's a good idea.

PAUL DAYTON: So Art stayed down --

GERALD KOOYMAN: He overwintered, and I went home. And that was -- in a way, that was kind of hush-hush for a while. He didn't talk to me about what he was going to do until, I don't know, but he stayed. And I don't know if that was called a TSK -- it's this [INAUDIBLE] depth recorder the Japanese made. And it was used for putting on trawls and things like that, if you are going to drop a line you could measure. And it had smoked glass on it and it had a sensitive bourdon tube in there that measured it. And I don't know -- that's what I don't recall is if there was one down there or they ordered one or I ordered one when I got back to Stanford and I had it sent down. Because I just looked this up and figured it out as far as the paper was concerned and all that, that Art clicked the recorder on in 1962 after he'd overwintered. In November of '62. Of course, I was gone then and didn't know anything about that part of it. But he put it on, and they put it on two females, didn't say where they put it on, just next to an ice crack. So I wouldn't be surprised if it was in shallow water and it was pregnant females.

And after it had been on for a couple of days on each one of them, and they replaced the glass slide in there five times. So they got a maximum depth of 350 meters, and that's not very deep for Weddells, I learned later. It may have been the location where they were. And if these were pregnant females, they may have been -- at that time of year they had been getting ready to pup, so they weren't going to go very far.

PAUL DAYTON: So Art did that in '62.

GERALD KOOYMAN: Yes, and I don't recall knowing much about it until the paper was published in '64. I was down in '63 working on my thesis.

PAUL DAYTON: You went to McMurdo in '62?

GERALD KOOYMAN: No, I didn't. I wasn't down there at all for that. So all that was done -- I don't recall knowing anything about that going on. And so I don't know when I learned about -- they had done something -- I know I knew about it somewhere because I was trying to gauge what kind of recorder and what kind of depths I would be looking at. Because I was in the process for my thesis of building a time depth recorder, which had never been used on a diving animal of any sort. So when I went back in '63, I didn't know about that. I don't know when the paper -- the paper came out in '64, and I don't know where I was as far as -- by then I had recorded a bunch of dives and knew that they were diving longer than what they suspected and deeper than what that was.

Then I noticed somewhere in there that I guess [INAUDIBLE] was speculating about Weddells swimming from one hole to another and wondered about that. But they also knew about the seals at Heald Island, which is up in the glacier area. And about the seals at White Island, and how they got there because there's shelf ice, and so their paper talks a lot about the shelf ice and how they swam under it and got there and how they got there. That's still a mystery. I mean, Heald island isn't so much because there is connections all the way out to the south, but not for White Island. And the suspicion is that there is -- an ice shelf was back much further at one time, and the seals got established at that time. They got trapped in there and had been there more or less -- we know some of them have traveled overland to get out to the south. That's been both verified by animals that we have seen that were in pretty bad shape when they got to the runway, the barrier runway, but also a couple of them were tagged, and they turned up out in the Sound.

PAUL DAYTON: So do you have more memories of '61, your first summer?

GERALD KOOYMAN: Well, '61 was a hard summer. We were working on fish all that time and trying to do this stuff in between. So really long hours and a lot of fish traps. But it was -- well, in those early days it was kind of a free-for-all. The really, the honcho grad students there were Jack Littlepage, John Dearborn, and John Pearse. They all overwintered and had been there, and so they had a lot of experience, and so they were tutoring Art and I and all of that. Sort of lorded it over us in a way.

And then I don't know how that all evolved. I didn't have a whole lot to do with them, and then Pearse, I know, left at the end of the summer on a ship. I think it was the freight ship that brings stuff in. I don't know when Dearborn and Littlepage left in that year either. And I don't know that those guys came back again.

PAUL DAYTON: You are talking about December.

GERALD KOOYMAN: '61.

PAUL DAYTON: When they were bailing out.

GERALD KOOYMAN: Well, I don't know when Littlepage left. And their memory of probably of what Art and I were -- may be better because, you know, just something new -- everything is coming at you, a lot of stuff would just go by you whereas they may have remembered some aspects of that. I know I got really hurt down there at one point where -- it was a dangerous place, because nobody cleaned up rubbish. It was all over the place, you know. Old boxes and that were undone. And then this is in the days of the honey buckets, and they were all taken on the front of the ice right down on the ramp, right in the front of the station where anybody coming up from the airstrip and all that would see. These were all laid out. The dump was up there, everything. And they threw everything away. They threw planes away. They threw a DC-3 away, they put that down, parked it down there. And that was carried over from World War II where they just dumped everything after the war that was out in the Pacific or wherever it was.

But this one time we were carrying a really heavy something-or-other, and I was on a corner. It was Dearborn and I think Littlepage and Pearce, but I was on one corner. Anyway, I wasn't strong enough. We started to set it down and we started to go down and it just took me down and I couldn't stop, and there was a box, a broken open box with a nail sticking straight up, and I went right down on the nail. Oh God, it really hurt. I just felt that thing going in, you know. I don't know what size nail it was, but it seemed big. And went right up under my kneecap. So I sort of passed it off for the rest of the day, but when I got up the next morning or something like that it was really stiff. So I went to the clinic and the guy there stuffed a gauze something or other down the hole, just stuffed it in my kneecap and they left it there as a drain for a while. But I couldn't bend my knee for several days or a week or something like that. But that's the way it was, it was one thing after another as far as damages.

Another time we had these winches that we had to crank over and bring up the cages and all that from the bottom, and when they were cold they were a real son-of-a-gun to start. And I grabbed a hold of one and yanked on it, and when they don't go sometimes they will snap back. If you've ever done a cold start -- it snapped back so hard that it peeled my nail right off my finger. I'm dancing around and blood flying all over. So it was a series of that.

And then working on the metabolic chamber that Curly had for this, it's all in the lab, but the water temperature matched the seawater. And we had to work with bare hands in that. We didn't have proper gloves to get these fish in and out. Paul knows that because he did it the following year or two. There was a lot of pain that would come, because you would keep working as long as you could stand it because -- to get it done, you know.

PAUL DAYTON: You then left Berkeley and you went to the U of A in '62, where I met you.

GERALD KOOYMAN: Yes, it was '62.

PAUL DAYTON: Yes, I was there in the zoology department. You showed up in Macauley. So bring you back now, because you've been to the Antarctic, you saw the seals, you set up Art with that paper.

GERALD KOOYMAN: Well, I hadn't seen the paper. I didn't know about that at all. I didn't know about the paper. I knew about it because I was -- I know I must've been getting from Art about depths and all that because I would have to think about in terms of designing this time-depth recorder and all.

PAUL DAYTON: Why don't you bring yourself up, because how you got to Berkeley - to U of A, of all places, where I was, of all people. Go ahead.

GERALD KOOYMAN: Well, that was easy. Some of the decisions there -- I was agonizing about where to go to graduate school and all of that. I actually had my eye on U of A before I came to Berkeley. And the attraction of the U of A was at that time Tucson was a small town, and it was a small department. At UCLA it was formal, and at Berkeley it was even more formal as far as seeing profs, nobody had open doors. It wasn't like here (at Scripps Institution of Oceanography) or anything like that. You made appointments at the Museum of Vertebrate Zoology at Berkeley, you made an appointment with the secretary there, and then they would take into the back rooms or you would come back and they would take you back there and all that. And I remember I went in and I was thinking well, who should I study under. It was O.P. Pearson I wanted to study under, and he was independently wealthy and didn't take students.

PAUL DAYTON: Who was that?

GERALD KOOYMAN: O.P. Pearson. He was an [INAUDIBLE] physiologist of the day. And I cut my teeth with Bartholomew at UCLA, and they were kind of compatriots. They had both been at Harvard at the same time as well as Donald [INAUDIBLE] had been there. So they all overlapped in that time, so it was out of that kind of biology that was going on, a combination of physiology and natural history. So when I got to Berkeley, Pearson wasn't taking students, I was looking around and I thought well, Patelka [phonetic] is an ecologist. So I went in and talked to him in his office, and it put me off knowing him. Because he sat there reading his mail as I was talking to him, so clearly there wasn't much importance with that. So I thought well, that's not going to work.

And in the end I was going to work under Alden Miller, who was an ornithologist there. But then when I got this job to go there, I started rethinking all of that. So U of A just seemed perfect, because at UCLA to get out in the field -- it was a four hour drive to get out of Los Angeles. And in Tucson it is a 15 minute drive and you are out of town.

PAUL DAYTON: Really out of town.

GERALD KOOYMAN: Yes, really out of town. You were out in the Sonora desert, and it was the most beautiful desert I had ever seen. I didn't know that much about it. I had been through there in my Navy days, Verne and I drove down through Arizona and explored some mines, Nevada mines, looking for bats and all of that. And we went down to [INAUDIBLE location in Gulf of California]. That's when there were grouper right in shallow water and all of that. So I really liked that area. So when I got accepted there, that's where we were going. And Mel and I got married in summertime.

And to use up some of the time there, I quit Stanford. I don't know, it must've been in the Spring. But I stayed at Stanford working up Curly's data, so I got to know Littlepage and Pearse, really, and Dearborn there. They were all working on their theses and worrying about that. But anyway, they recommended I go to Hopkins Marine Station to take a marine biology course there, and that would've satisfied my need at Arizona. And so I did that, I took a course from [INAUDIBLE], who was made professor for Pearse. And he was just outstanding, the course was just great. And I sat in on a couple of other courses while I was there. So I really got introduced to marine biology well there. And in the end, I didn't need to fill that course requirement because when I got to Arizona two or three years later, Stanford was doing this [INAUDIBLE] expedition thing where they were taking graduate students, and it was 15 course units to do that. So I applied for that one on [INAUDIBLE], and I got another bunch of marine biology credits while we were out there in the South Pacific.

But Tucson worked out really well. It's a small department and everybody was pretty laid back there as far as the professors were concerned. And it was easy to do field work there. So I did a couple of projects while I was taking classes there. One on kangaroo rats, which was really a lot of fun. I was interested in this concentrated milk that people were talking about that seals had, and I said well, if they have it because there is a lack of fresh water around where they are and all that, then something like a kangaroo rat ought to have concentrated milk as well. So I did a study for a senior problem, or a problem in comparative physiology in class. And they do, they have concentrated milk. So I published that in Science. I thought it was pretty good. So I had a pretty good year that year.

PAUL DAYTON - How did you end up measuring the Weddell's diving depth with the TDR?

When I first thought about working on the Weddell's diving behavior, the major obstacle was finding a small, cheap depth recorder. Nothing was available commercially. Art and Curly had used an off-the-shelf, TSK depth recorder that was heavy, bulky and not easy to attach. Expensive, too. I knew that Scholander had used capillary tubes dusted with a water soluble dye when measuring dive depths of fin whales that had been harpooned. I gathered together all the glass tubing I could find at the U of A, and with some modifications from the Scholander design, I wrapped them in neoprene for light and easy attachment to the seals. I had more than 100 of them to take down in 1963, but they only measured max depth.

Back in Tucson in my quest for a small TDR (Time-Depth Recorder), I looked in vain through catalogs and science reports. All were too large to suit my needs. There was no other way than to design and build something custom-made. Howard Baldwin (Sensory Systems Laboratory in Tucson) was not willing to help because he was not enthusiastic about mechanical recorders, but he recommended a local watch repairman in Tucson. Mel and I searched through scrap metal yards to find the right size and weight for the casing. I used her kitchen timer for the prototype. Bernard Strothman, a local jeweler—had a shop in downtown Tucson near Jacomes Department Store—helped me package everything together and seal it. We made six instruments to use along with the capillary tubes.

The first seal I ever put a TDR on was collected at Cape Armitage and brought back to a hole we cut about 1.5 km away in the sea ice. After releasing it, I worried that something had gone wrong because I expected it to return to the hole. Anyway, remember Murray Smith, the Kiwi (New Zealander) doing population studies on Weddell seals? The seal showed up back at Cape Armitage with the TDR pack on its back. Later that day Smith spotted the seal, removed the pack and returned it to me. The seal had made a 26 minute dive to 55 meters on its way back to the Cape. I realized that the ice-hole was too close to the Cape, but I was excited to realize that the 26 minute dive was the longest submersion, natural or forced, that had ever been reported for a seal. NSF continued my support for the next season, and I was able to hire Chuck Drabek as a field assistant. He was a former football player, and I figured I needed the muscle. Turns out he was a good choice for many other reasons, too. Chuck just retired as a professor from Whitman College in Walla Walla. We're still in touch. Jane, his wife, and Mel became good friends, too.

I don't remember when the Skyland Orientation meetings got started, but it was a good opportunity to get together with all of the teams that were going to the ice. The Navy people were there, too. I remember that Ambassador Daniels (Paul C.) who was instrumental in getting the Antarctic treaty formalized and signed was there and actually read the treaty to us. The most historic speaker was Sir Charles Wright. He had been on the Terra Nova Expedition with Scott and told the whole story of the trek to the pole. Wright had hopes of being on the team that went on the last leg and was disappointed not to be chosen by Scott. He was with the team that discovered them the following season. I think George (Llano) wanted us to realize that we were going to be part of Antarctic history, too.

The NSF reps, the first NSF rep I met was Phil Smith, and the second was Bill Austin—an interesting guy. He was a “caver”—lived in Kentucky, near Mammoth Cave, and also had a cave on his or his parents home. I think his connection with NSF came about as a friend of Phil Smith, who may have also been a caver. With a group Bill tried to make a trip on the Colorado River in a jet boat, but had a serious accident. In his boat he went over a large wave and into a deep hole and the force of landing broke his leg. He was medevaced out, and the expedition was the first with jet boats that also went up the river. The rep who took his place was Jack (John) Twiss. He was a young guy, but highly competent and easy to get along with. He later became the executive director of

the Marine Mammal Commission in WDC, as you know. We stayed in touch over the years and attended his memorial service. He also, set up a dinner to celebrate Llano's 90th. He covered it all, but had to leave before the conclusion of the dinner because his tremors got so bad. He had Parkinson's Disease, and his final days were difficult and discouraging.

Tom Poulter is a long story. In brief I met him while staying in SF while Mel was doing graduate work. Don't recall who introduced me to him, but possibly Roger Gentry. He invited me to come and give a paper at Coyote Hills, the acoustic lab he built while he was director of SRI, and still was at the time. Not long before the talk he told me it had grown, as far as the attendees. There were many luminaries in attendance, and other papers given. It was the seed for the marine mammal conferences, and his mailing list was what Norris and others used for the beginning of the conferences.

The next year Poulter asked to go south as my guest, and Llano was pleased to have him go until the Skyland conference. At a meeting there with George, Schevill, Watkins, I think Ray, and myself it turned into a crisis. Previously and presently there was conflict between WHOI folks and Poulter. Schevill challenged Poulter going and threatened to withdraw if he did. I was in the middle of all of this, and it was very upsetting to say the least.

PAUL DAYTON: Back to your original proposal, It was just the one year, and meanwhile you had written a proposal to Llano.

GERALD KOOYMAN: Yes, I was writing a proposal to Llano which went to Curly to approve, whether it would work in the bio lab and all of that. And Curly's main criticism of that proposal was that I didn't have an assistant, that I was going down there to work on these 400 kilo animals on my own. And I did. And you could never do now. --

GERALD KOOYMAN: That was in -- was that '63? Okay, you were my assistant. When was Peter Koerwitz [phonetic] there? He was there then too, wasn't he?

PAUL DAYTON: He was there -- I'm not sure when he was there.

GERALD KOOYMAN: Well, he was -- I think he was there the same year, because I got him to come out too. And Curly got on my case about borrowing his technicians. And the lab help.

PAUL DAYTON: Do you remember how much the grant was for?

GERALD KOOYMAN: So, yes, it was for I think either \$5300 or \$5800. And it got criticized by an Indiana representative called Roudebush who was trying to mimic Proxmire on the Golden Fleece award. And so it made the front page of the Tucson Times or something about this graduate student is being funded all this money, this huge sum of money, to go to the Antarctic and sit on an ice block and watch seals and all that. And [INAUDIBLE], bless his heart, really came to the defense of that.

PAUL DAYTON: And so did George Llano.

GERALD KOOYMAN: Yes, Llano did to. In fact, Llano said he got a lot of mail about that.

PAUL DAYTON: Llano covered a lot of backs.

GERALD KOOYMAN: Yes. So I went down there and worked alone, and it really wasn't very feasible to do it that way. Especially because I ranged all over the Sound, so I was out all over the place from the ice edge up at McMurdo Sound all the way down. I was on my own with this trustee snowmobile.

MALE VOICE: That's when they let you go to the ice edge in track vehicles alone?

GERALD KOOYMAN: No, they didn't keep track of you.

PAUL DAYTON: We had a power wagon.

GERALD KOOYMAN: Yes, I did it on a snowmobile. But one of the funny things about it was -- as I say, it was kind of a free-for-all down there. Well, one year, in '61 -- I will come back to this business of my being out there solo if you want -- but in '61, we were doing -- we were putting traps out after they brought the huts in and we were still putting them down holes, and the ice was getting so rotten. And we ended up with a trap set out around the corner towards Scott Base. And Art and I had to go out there and get that thing. And we were standing on rocking floes pulling that up, and we had the Nodwell parked right behind us, and ice was breaking up. So we were lucky to get the traps and us and the Nodwell out of there without losing anything.

But then we went back -- it had to be later -- and Verne, we had this Weasel down there that did not have a top on it, that was an old recovered tracked vehicle that somebody had pulled out of the dumb and fixed it up. And we were driving around. And it didn't start very easily. But the ice was going out. And it was amazing how it did it, it went out all in one 24-hour period. We looked out from the chalet, or whatever we had for a chalet at that time, and saw it going out in these big half-moon floes going. So we jumped in the Weasel and drove up behind Cape Armitage there, went out in front of Scott Base to see this because whales were coming in. Both killer whales and minke whales. It was a fantastic sight. So we go out, and we parked alongside where it's drifting out back a little ways, and then we ran out to the edge to see it all.

And the next thing we knew, Verne and I are standing there together, we see Art with a chasm between us of about oh, maybe 20 or 25 feet. And Art is standing on the other side of it on this floe, and he is soaking wet. This was his second floe. He had gone out and one had popped out, and he had taken his camera and threw it across, and then he made a running jump to this floe. But he didn't make it. Well, he made it halfway, he caught it with his hands and landed in the water. And so he climbed up on the floe, and then he ran across the floe only to find that floe was parting to. And they

were going out, they were hinging. So he was running back and forth and wondering what to do. And we looked down and we saw him, we saw that he could run down.

So Verne ran down there and Art went down with him and helped him get across that. Because by then he was really cold. And then I ran to the Weasel to get it going, and I flooded it and killed the engine. And he was so mad at me because we are working like mad because the ice is still going out, and we're parked on some of this stuff. But in the end I got it started. Thankfully, because Art by then was freezing over. I mean, his whole coat and everything, his beard and everything was all ice. And this was late in the season. So we roared off, and then he froze to death because there was no top on this thing. I'm driving, and this thing was really fast too, and I drove pretty fast to get off the ice and get up on the hill.

As I say, there were no communications at that time during any of this. Not for years afterwards did they have -- now they are built into the vehicles and people have handheld, but there wasn't anything like that. I don't know, there may have been a vehicle or two that had a radio in it.

PAUL DAYTON: I was involved with helping you cut those holes. And it seemed like I spent a huge amount of that summer helping you cut holes.

GERALD KOOYMAN: You probably did, because as I say, you can't do one of those holes alone. This is at a time when it was all chainsaws. This is even before we used explosives. Because they wouldn't give them to us. The chainsaws were pretty long, they were at least a three-foot blade that we were using.

PAUL DAYTON: My memory of this -- what I liked about Llano was that he had to sort of fund the heavyweights like Carleton Ray, men with tons of money and very expensive projects, hordes of people. But he knew that the science was going to be with the young guys that had good ideas were independent. And so he was always taking chances on you and on me, on Art, on everybody. And so as I recall, I thought your grant was \$4800.

GERALD KOOYMAN: That was including overhead.

PAUL DAYTON: Yes, maybe. But I do remember that Carleton came down with a relatively huge grant and lots of important people from the Arctic and the Navy. And he sat around with all of those guys in the ward room because he didn't know how to cut a hole. And you and I were out there cutting that hole in that book (Carleton Ray's article in Zoologica, 1964, Volume 49, starting on page 141). And he came out to watch. You would move that house, it was your house and it was sitting there. And we would cut down a little bit. And he wanted to take a turn because he'd agreed that you'd let him use the house. So you and I went in to lunch, and the last thing you told them -- and I remember -- was, "Don't let the saw get stuck in the ice. Because we will never get it out. You have to keep it moving." You gave him pretty good direction. And he cut a

few inches and instantly stuck the blade in the ice and walked off and left it frozen in just about where we had it when he took over.

So Jerry and I came back and found the saw stuck right where it is in that picture in Carleton's paper. So we had to go up and I had to rebuild the second saw that wasn't running, had to redo a whole carburetor and we spent several hours to get another saw to saw out that saw. Which we finally did. And then we cut the hole and it flooded with all of that brash ice, the ice itself it was 15 feet and there was all that brash, it was a day or two getting it out. All of this -- Carleton's only thing was to come down and stare at the hole sticking the saw, but he published a paper implying he had cut the hole.

PAUL DAYTON: But that's your hut in the picture and the hut has a sign on it that says "New York Zoological Society, field lab" or something. They have the initials NYZS on the hut, and then it says US Naval Applied Science Laboratory. Something else.

GERALD KOOYMAN: Yes, we took that off. There is a photo of Paul and I on the front that says the University of Arizona Antarctic Research Team.

PAUL DAYTON: We came back when we saw that. I went back to sawing the saw out, and you had a big shit-fit by the door, you ripped that sign out. Anyway, I thought that needs to get in there. Mainly because of the -- this was the whole history of Carleton, and if I ever do one of these, I've got some Carleton stories that are a lot worse about my being kept on the ice in 1964 until I blasted a huge hole for him. I resisted for a month or so, but finally did and showed up in a movie my brother saw in New York with me suddenly one of his team.

GERALD KOOYMAN: Essentially there are three generations -- they're not really generations, but close to it -- there was Littlepage, Pearse, Dearborn. And then there was -- DeVries, I came a little later and he'd already started. So it was DeVries, myself, I don't know who else would've been involved in that. And then there was Dayton or a Robilliard group that --

PAUL DAYTON: -- in '63, but --

GERALD KOOYMAN: Yes, I know, but then he came down. That's what I mean, though, when you actually had your own project. The amazing thing about Paul and his project down there was that it was not his thesis. It was this major endeavor in the Antarctic, for which he is still getting credit, all kinds of credit now. People think he is an icon for those who are doing studies down there now, on these [INAUDIBLE] studies on the traps that they can't dive to because it's not legal, it's against the code. And Paul was diving to put the traps in in the first place. And this was not Paul's thesis, this was a sideline to what he did up at the University of Washington where he went to grad school. I was thought that was amazing, you had dual thesis going on there.

PAUL DAYTON: A lot of fun.

GERALD KOOYMAN: Yes, that's what it boiled down to.

PAUL DAYTON: But getting back to you, not me. Curly went to Texas in '65, I think.

GERALD KOOYMAN: Oh, did he go that soon? Well, I lost track of him, because when I left I was not in touch at all with Stanford.

PAUL DAYTON: Me, either. The next question I had which is just a generic question, the relationship with the Navy. Because I remember in '63 when I got there, it was pretty hostile. And then I had all sorts of hostile interactions with the Navy. But Littlepage and Dearborn remember it as just being sweet, benign neglect. They were friendly, no problems. Do you have any idea what happened?

GERALD KOOYMAN: No, I don't, I didn't have too many problems with the Navy either. And it got better as time went on. I think people learned to work more with each other. When it started in '57, I think, it was a Navy show. So then there was this phase that took 10 years, anyway, of getting used to working with civilians and civilians getting used to working with the Navy, I suppose. But you remember a couple of those incidents.

I got really inflamed because they would keep stealing my snowmobile, and this was key to my thesis as far as I had to have the mobility. And some of these enlisted men would get on and steal it, didn't take off and go up to the airport or everywhere else, and running it and jumping over snow hills and things like this. And it would make a wreck out of it.

PAUL DAYTON: They tried to burn it, remember, they turned it over.

GERALD KOOYMAN: That's right, they did one time. They would get drunk and all that, you know. It was really bad. There wasn't good control on that aspect of it. And then when you come and complain to their commanding officer about this or something, you know, they would just give them a little slap on the wrist and say well, don't do this anymore. And then they turn around and do it again. But I thought they should put them in the brig or kick them off the ice is what I thought they should do to them. So that didn't sit very well as far as -- but generally, in those days I pretty much avoided the Navy. I didn't have to have much to do with them. It wasn't until later on when I started flying a lot that I had to work with the Navy more. And that was in the late '60s and then on from that.

PAUL DAYTON: Well, in the mid '60s -- the Navy pilots were a joy to work with, unlike rest of the Navy. I mean, do you remember Jim Brandau?

GERALD KOOYMAN: Well, I'm really glad you brought up his name, because I've been trying to remember Jim's name, and I had forgotten it completely. I remember that Jim was the best of all of those pilots. This guy was a geologist by training and then went in the Navy. I don't think he was planning on making a career out of it, but he just

loved flying down there. But he was out of the plane faster than the scientists were to get out there and start looking around and everything afterwards. And I had one experience with him that just showed sort of the kind of guy he was. At that time I don't remember if they had a copilot or not --

PAUL DAYTON: They did.

GERALD KOOYMAN: They did, okay. Well, I don't recall them having a copilot on that flight. I know there were a couple of times when I flew up in the cockpit, that was later on. But on this one trip, this was in '69, I think, so we are going to sort of fast-forward a minute here. But I was on a flight with Brandau where he took us to Crozier, it was where we did our first Emperor diving studies. So we were out working on the ice edge at Crozier, and that was a record in itself, no one had spent that much time at Crozier on close support next to the ice edge, and we were there for about four to five hours. Maybe even six. Because I was putting these capillary dive tubes on them, and I wanted to recover them before we left so I'd know I'd get them back.

I had gone back there because I had been out there a week before, and when thin ice had developed. Very calm weather. And the birds had created their own holes and were diving up through those, and the ice was about oh, may be nine inches thick. It was wobbly. You could get out and get by the holes and get these recorders on them and get them back. But in the process of that, Jim was out helping catch birds. And a bird slipped out from under him, he was kind of holding it, and he fell and hit the bridge of his nose right across a chunk of ice sticking out next to him -- on the ice edge. And it really hurt him. But he said I'm okay and all of that. So we let it go and kept working, because it was early in the session. And then when we got ready to leave, I'd already had a little conversation with him about flying over Mount Terror. And I thought wouldn't it be nice to see with that looked like from the perspective from down on Crozier and all of that.

And we had a full plane, so I said as we were leaving, "Do think we will be able to do this." And he said, "We'll see." And so he started circling around the slopes of Mount Terror --

PAUL DAYTON: These were the old Sikorsky things.

GERALD KOOYMAN: Yes. And he was looking -- what he was doing because he couldn't fly directly up, we were too heavy. And he was flying, and he was looking for lift. And he would catch these thermals I don't know if you can correct for a place that cold, but anyway he was looking for these uplifts. And he worked his way up, and so we went over the top of Mount Terror. I have actually seen the crater of Mount Terror. I thought that was pretty good.

And then when we came down on the other side, we said well, we ought to go to the igloo. I've never seen it. None of us had. This is where the tent was, where Wilson and Bowers and Cherry-Garrard stayed.

Igloo Spur is what I think it was called. So we landed, and it was a long slope down to where it was. So we went down there, and I had an assistant with me, and he took a fall while we were going down there and I didn't pay too much attention to that. But then he wasn't paying much attention to this, and actually I think it might've been the other way around. I think we went up and had a look at Terror after we went to Igloo Spur, because the guy that was with me just sat back in the corner. He wasn't saying anything. So Jim got us up there, and I thought to myself why isn't he as excited as I am about looking out and seeing these views and all of that.

So we got back to McMurdo, and they went to the hospital. And Jim had -- the break had actually caused cerebral fluid or something to leak. So he was in the hospital for a while healing from that. And my assistant had taken a fall and broke his collarbone. That was Walt Campbell. I don't know if you -- I don't think you ever met him.

PAUL DAYTON: Yes, I did. You know, there are several things that are blurred in my mind too.

GERALD KOOYMAN: Well, maybe my dates aren't right.

PAUL DAYTON: The dates aren't quite right, because Brandau got out of the Navy in '64. And re-upped in '68 but did not come down until 1969.

GERALD KOOYMAN: It had to be '68.

PAUL DAYTON: Well, Brando re-upped and '68 or '69. But he did not get back to the ice until 1969 -- I was there in 1968. But I recall that he came down to fly with Tom Berg -- he was flying Berg when Berg was killed in the crash. But that trip that you were talking about where he landed, I think I was with you.

GERALD KOOYMAN: You were on that flight? I think you were. Yes, when we went up to Terror?

PAUL DAYTON: Yes, but Brandau didn't fly. That would've been in '67 or '68.

GERALD KOOYMAN: Well, there were two flights.

PAUL DAYTON: I think there are two flights that are sort of blended.

GERALD KOOYMAN: Yes, that's right. I think you're right about that.

PAUL DAYTON: It probably doesn't matter to the history, the point is that this guy was a spectacular pilot and we had good cooperation.

GERALD KOOYMAN: Yes, right. The guy that flew us there the first time, that was, I think it was in September.

GERALD KOOYMAN: They had started flying early, and I had come down on Winfly in order to – do some night diving studies of Weddell seals.

PAUL DAYTON: That was a Winfly. In fact, that was winter, it was September 12 or something.

GERALD KOOYMAN: When we landed, the pilot stayed in the cockpit.

PAUL DAYTON: Yes, because it was cold, it was 50 below.

PAUL DAYTON: He said the penguins would fall off their mothers feet and freeze solid.

GERALD KOOYMAN: Oh, a couple of people did not even get out of the plane, it was too cold. But we did, and then that's when you think we went to Igloo Spur was on that flight?

PAUL DAYTON: And at that point --

GERALD KOOYMAN: I think we went back to Igloo Spur a second time.

PAUL DAYTON: Of course, because it's a famous place. But at that point, Shoemaker and and some other helo pilots had already cut off the tarp and it was just what was frozen in the ice is what we were able to see.

GERALD KOOYMAN: That's all I remember seeing. There was actually a tarp that went completely over -- I remember seeing parts of the tent there, not very much. Because I think when we went it was the first time I had been there too.

PAUL DAYTON: But for the purpose of history, the point is that in the '60s and into the early '70s, we had wonderful support from the helo pilots.

GERALD KOOYMAN: Yes, everybody was very gung ho about being down there and doing that at that time.

PAUL DAYTON: And we got all over the place, and Brandau was really important to me because he was Berg's personal pilot, and I went with Berg on a heck of a lot of flights, many of Berg's flights in '63 and '64.

PAUL DAYTON: Helos were not supposed to fly over water, but out of sight they did. But it was the old Sikorskys. And they weren't very reliable. They crashed fairly often.

GERALD KOOYMAN: Well, I think it was in part also the pilots' experience.

PAUL DAYTON: Well, our pilots then were from Vietnam. And they were happy to be there and they were good.

GERALD KOOYMAN: Well, they were good pilots, but they didn't have backcountry experience as far as flying in polar regions. And I remember one that we went to the wreck of it one time where people were injured in that, a guy plowed right into the sea ice, he was in a whiteout, he smashed the plane. There was a streak of the plane parts down to the cockpit. There were people injured in that one too. Didn't have a horizon and he just flew into it and hit hard.

PAUL DAYTON: Art and I were out in the icehouse and they went right over us. And it was a whiteout. We were out there because we couldn't see to get back. But he was right over us, so I figured he could see because he was above us. We saw him go over. And I didn't know he had gone in. But yes, maybe two miles more. He just flew into the ice.

So anyway, I just wanted to -- I wanted to try to get a transition with various people of the support, the science support. And I think that the XE6 pilots were good and nice and helpful up until maybe the late 70s or early '80s.

I don't know -- it seems like you have already done [INAUDIBLE] with your gadgets. Maybe the history is better left to the things you don't have already written up. But do remember your relationship with Murray Smith and Ian Stirling and the Kiwis in general, do you want to talk about that?

GERALD KOOYMAN: Well, Murray and I -- we weren't doing even close to the same thing. He was doing this tooth structure stuff and all of that. He was kind of a ruthless guy, I thought, so I didn't really work with Murray. I went over to get blood samples when he was shooting and things like that, but that was something I didn't do any more than I had to do, and I didn't want to do any of that anymore. So I didn't see Murray a whole lot, except one time he put me off because he said, when I told him that I had a record dive of 600 meters, and by then I think it was published -- but I don't recall if I was still working on it. And he said well, I don't believe that. That's not the thing to say to somebody that's really been working hard on devices and that. And he said, "The Sound is not that deep." Well, it is that deep. But otherwise we got along, but he didn't do the same things I did.

But Ian and I really got along well. And Ian came after Murray. And he was doing -- I'm trying to get the sequence there, because he was around when Carleton Ray was around.

PAUL DAYTON: Ian was there, and he showed up, I think, in '67.

GERALD KOOYMAN: Well, Carleton still coming down there then?

PAUL DAYTON: I don't remember.

GERALD KOOYMAN: Okay, well, I had sort of forgotten that.

PAUL DAYTON: It was Zapol --

GERALD KOOYMAN: No, Zapol was completely separate from that. But I'm trying to figure it out. Well, anyway, when Ian was there -- I know he was there then, because we had sessions where he would stop by my hut because he was really still wandering the Sound, he was tagging all the seals on the Sound, and I was finished with that kind of work by then. And he would stop by the hut and we would have a real gab sessions. And we would go back and forth about stories about Carleton.

PAUL DAYTON: Yes, he had a little 4-wheeler thing, he called it a gnat. A little four-wheel-drive --

GERALD KOOYMAN: Oh, yes, that's what it was. Yes, it wasn't as fast as my snowmobile.

PAUL DAYTON: No, it was old-fashioned four-wheeler thing. But he showed up -- Gordie (Robilliard) and I were still shivering before we hit the hot tubs, you know, so we were trying to get our hands to work to get our clothes on. And he opens the door up and the wind came in, and we were sort of half naked and wet.

GERALD KOOYMAN: He was really a good guy, though. He was one of the real treasures of people you meet in fieldwork and all of that. Some of them were just okay and others you don't like and others that were just super people.

PAUL DAYTON: Yes, I would say that Ian is still one of the best people I know.

GERALD KOOYMAN: Yes, he is still going strong. He's got a real deal, something is looking out for him because he went from there, he went back to Canada and did his studies on polar bears became the world authority on polar bears. But that means a lot of flying, and he has been in a lot of crashes and survived them. And he's gone into polar bear dens that he thought were empty.

PAUL DAYTON: He talks about one of his technicians just getting thrown out -- and the pilot actually saying something was wrong and had the plane up over the den just as this guy came flying out of the air, you know, and the bear came roaring after and the guy is hanging on the skid.

Back to the ice, did you interact with Bill Sladen any?

GERALD KOOYMAN: No, I stayed away from Sladen. He seemed like a dangerous man to me. No, I was very intimidated by Bill, because he was a typical British professor kind of thing. And so you knew your place when you were around Bill. But I interacted with his students, especially Dick Peterson. And that's how I got to

Crozier one time was because Dick invited me over and Sladen was not around. And then I knew Bob Wood well, so I --

PAUL DAYTON: And Dave Ainley.

GERALD KOOYMAN: I never knew -- Dave was around, but I never knew him at that time very much. I think it was in between the years that I wasn't down there that he was there. But Sladen was an interesting person himself, and what is curious is -- he was on another icebreaker, I think it was the Burton Island that was to meet the Glacier at Coulman Island. It was already there with John Dearborn. Sladen came in the next day or 24 hours later. And it was supposed to be a rendezvous there for some kind of work they were going to do.

PAUL DAYTON: Bill Sladen is the first person who did serious work on Adélie Penguins at Cape Crozier.

GERALD KOOYMAN: Yes, he really didn't work seriously with Emperor penguins, it was mainly Adélie Penguins. And that he was one of the first to make a documentary that was shown worldwide on national television and all of that on penguins.

PAUL DAYTON: He sort of owned Cape Crozier, and he wanted to --

GERALD KOOYMAN: Oh, yes, things were really very territorial in the Antarctic at that time as far as investigators having their place. Probably still are, but then it was more well-defined, probably, because there weren't so many people there. And also Crozier was Sladen. But Sladen and George had battles.

PAUL DAYTON: Sladen came in -- one time he came in while I was in the bio lab, and he had just come down and gotten off the plane and people were already talking for days, Sladen is coming. And here comes this guy. I had met him, and he's, "How are you doing, Paul," and he comes over. "You know, I'm just trying to get to Crozier. I hate this place, no offense to you. I hate being around here, all these assholes." And I'm just sort of sitting there. And he says, "The only way you can get ahead in this world is to be a bigger asshole than they are. You just get to be really obnoxious and it gets you right out to Crozier right away. Now watch." And the next day he was gone.

GERALD KOOYMAN: I can believe that. But that's why I didn't have much to do with him either, because he wasn't in McMurdo very long, and that's where I was working at McMurdo. And when I did go to Crozier, I'm sure that I went when he wasn't there. He didn't stay long, actually, as far as I know. He would go out there and get things -- or come in after they got it set up, or go out there and help set up. I don't know. And do that.

It is changed quite a bit as far as where the location of the huts are and all. But their hut was more convenient when Sladen was there. Now it's kind of this box in an

inconvenient place. But they had to get it out -- they established a SPA there, and I think that is part of what carried that on, they had to move it out of the SPA.

PAUL DAYTON: A SPA?

GERALD KOOYMAN: Specially Protected Area.

PAUL DAYTON: Oh, okay. My winter -- so it would've been early September of '64, they flew over and found the hut gone. The year before they had gone out and taken that Jamesway and they had sunk 55 gallon barrels full of water. And basically, they had not sunk them, they tried to sink them and they had frozen them in with cables across the hut. And Graeme Johnston flew out there on the first flight when they cranked up the old DC-3 to get it going before the summer season started, and they circled the island. And the hut had blown away. All traces. So just to give you an idea of what the weather was.

GERALD KOOYMAN: Yes, it's unbelievable winds that they get out there. They've had winds where they have seen the Adélie Penguins go flying by. And the birds would be hunkered down in their nests, but every once in a while one would lift its head too high and be gone, so the mortality was terrible when they had those. There were bodies strewn all over down on the beach when that happens.

PAUL DAYTON: You know, I really hope to come out of this some rendition of how science is affected by the leadership in the NSF. And I've seen -- you've seen -- that change tremendously from Llano to Polly Penhale. And I wonder if you might just sit back and speculate on sort of the leadership and the freedom for visionaries to have their visions one and to follow their nose that Llano gave us with what you see now.

GERALD KOOYMAN: Well, what George did is he managed it like a dictator. But he was very successful. And I think he had a knack for picking people that he could see were going to do good things. But it was all fresh material. You couldn't do that now in any case. But it evolved. There was George and then I don't know who replaced George, it may have been Williamson.

PAUL DAYTON: There was a guy named Andrews and then Williamson. Do you remember the top people at the NSF, Jones?

GERALD KOOYMAN: Tom Jones was one of them. I think he was there while Llano was there.

PAUL DAYTON: That's right, and then Bert Crary.

GERALD KOOYMAN: Bert Crary was chief scientist, though, he was never the director. I think Tom Jones was.

PAUL DAYTON: Tom Jones was.

GERALD KOOYMAN: And then Peter Wilkniss was there for a while.

PAUL DAYTON: No, it was Ed Todd came next.

GERALD KOOYMAN: Oh yes, Todd came, and then Wilkniss.

PAUL DAYTON: Yes, so where did things go so bad and why?

GERALD KOOYMAN: Well, I can't explain that, but again, it sort of, the upper leadership, you just don't get involved with them, or a lot of the time you try not to. But the thing about the NSF, at least in that program -- and I suspect it's true in some of the other programs as well -- is that they are people that are career bureaucrats. And they move laterally or move somewhere so that when a position opens up someone within the NSF will move. And I think sometimes they are moved because the people in the other place want to get rid of them. So they move them over, and I think --

PAUL DAYTON: Ed Todd is, both of them are famous examples.

GERALD KOOYMAN: Is that right? Yes, [INAUDIBLE] was like that, you mean Todd and Wilkniss, and -- yes. And the problem about the polar program is that -- Antarctica is a special place, and so is the Arctic. And so they get people in there that have never had experience in either place. And that, I think, has been a problem. Some of them learn and some of them don't seem to have an interest in that. So Crary was in the early days one that had vast experience in the Antarctic and maybe in the Arctic as well. Yes, because he was the first man to set foot in both places, come to think of it. So they had some like that, but there was this issue of people coming in, and I didn't really have much to do with the directors of the polar programs. But I knew the program managers, and so Williamson, when he came in -- he came maybe after Andrews.

PAUL DAYTON: He was after -- he was sort of a little while, it took a while for him to show up after Llano. There was a guy named Andrews.

GERALD KOOYMAN: That may have been in a time when I wasn't going down much. Williamson was only the program manager for a while, and then he became chief scientist. And he had experience in the Arctic. Dick Williams had -- I don't think he had experience in either place.

PAUL DAYTON: He was laterally transferred out of the other NSF.

GERALD KOOYMAN: Yes, I think he was one of those. He didn't know a whole lot about the program, and in fact, he asked me once about -- this is when I was starting to do remote camps -- and he asked me who my cook was. And didn't quite fathom that. We did our own cooking and all of that. Because some of those camps, like over Dry Valleys do have a cook and all of that. But once you start bringing in personnel like

that, it becomes a little McMurdo. And you've got that group too, and you have to support those, and it just keeps getting bigger, so I didn't want to have any part of that kind of field camp.

And then there was Williams. And after Williams, I think it was Ted DeLaca but I'm not sure if there was somebody in between. Well, let's see, he was chief scientist for a while.

PAUL DAYTON: That's right, he was there for a while.

GERALD KOOYMAN: Yes. And so he came after Williamson. And I think Polly came in some time -- I know she came in while Ted was still there.

PAUL DAYTON: And I'm just trying to think of, about how things changed from Tom Jones, say, to Ed Todd. Todd just had no use for the scientists. Do remember when you and I were coming off the ice and they were x-raying all of our kelp, and the Kiwis were --

GERALD KOOYMAN: Oh, was he there then? I know that there --

PAUL DAYTON: A really good example of Todd at his best.

GERALD KOOYMAN: Nobody stepped in.

PAUL DAYTON: Well, he got mad at you because you are trying to walk your film around. And he got embarrassed by you, he hated his scientists, it was really obvious.

GERALD KOOYMAN: Yes, well, I had forgotten that episode, I was so mad about the whole thing. Because I know that there were NSF administrators there that were already through or something, but never came and put in a word for us. Because Steve Alexander and I were trapped in that situation.

PAUL DAYTON: He despised his scientists.

GERALD KOOYMAN: Yes, that was about the only experience I had with that. Wilkniss was a character in himself. It was just -- he was another dictator.

PAUL DAYTON: He was just about the worst person I've ever met.

GERALD KOOYMAN: He was a big, nasty guy.

PAUL DAYTON: I can't find anything positive to say about that creature. And he destroyed our relationships with all of our international friends.

GERALD KOOYMAN: Oh, yes.

PAUL DAYTON: I mean, he hated all the other countries. That's how, probably, how I got kicked off the ice because I had a Brit down there, and he hated that. He was a vile person.

Well, the other thing that I wanted your recollections was the weird noise we had on a dive. We were diving off the [Arrival Heights. I will give my version of it, and then if you remember yours, I'm not sure you do, but -- we were diving off Arrival] Heights. And suddenly we were just --

GERALD KOOYMAN: When you say "we," who --

PAUL DAYTON: Gordie and me. Maybe Bill Curtsinger, I think there were three of us and a tender. So this would be maybe '68 or '74. I just remember the event of just head-shattering electronic noise. We came out of the hole and into the hut, and it was an extremely loud electronic noise- it came up the hole. We went outside in our wetsuits because there was so much powerful electronic noise that it hurt our ears from underwater. And I went in and asked all the Navy people what the hell is going on, and they didn't know anything. "Well, we are doing some tests with the ground control approach at the strip." And that was all I could get out of anybody. And I sort of forgot about it until I mentioned it to you, and then you said you had this recording of it from Crozier. Do you remember any of that? I would love to get that tape.

GERALD KOOYMAN: I remember a recording, and I think I may still have it. I don't know if I can find it. It is a reel to reel tape. But that wasn't an extremely loud noise that I recorded.

PAUL DAYTON: No, you were it Cape Crozier.

GERALD KOOYMAN: Yes. What I recorded, though, sounded very mechanical. I can remember what it was, sort of a zzzzzzzzzzzzzt. And it would go off, and then zzzzzzzzzzzzzt. And at the time I felt that it was not an animal noise. But that's all I -- I will try to find the tape some time.

PAUL DAYTON: Yes, I would like to have you find that. What you told me at the time, or sometime later, that you played it for somebody, and he said that is a nuclear submarine.

GERALD KOOYMAN: Oh, really?

PAUL DAYTON: Yes -- to a Navy historian when I was on the polar research board. And his body language looked really uncomfortable. And he said he would like to have that tape. That was the word he said. So this is all I know.

GERALD KOOYMAN: Maybe it's gone, maybe it's been stolen. Well, I don't remember any of that, Paul. I have a complete blank on it. But I know who it would have had to be that I had asked about the tape who would've said that. And that

would've been Tom Poulter [phonetic]. Because he was a major force in the underwater acoustics and all. And that is who I was using for my source -- who I was playing the tapes for and getting advice about it and all of that. But I don't remember having a conversation like that. Maybe the Navy has so brainwashed me that if certain things come up, it just wipes automatically my mind.

PAUL DAYTON: Well, it wouldn't have been such a big deal if it had just been some funny background noise.

GERALD KOOYMAN: Yes, it was background noise, but it was so peculiar.

PAUL DAYTON: To us, was just something that I had never experienced before. We got out of the hut, it was so loud --

GERALD KOOYMAN: Yes, it sounds like it was right there in McMurdo Sound, right? Right under the hut, as a matter of fact. Well, you know, there are a lot of strange things going on in this world that are not supposed to happen and all of that. I could see them bringing a nuclear sub down there.

PAUL DAYTON: I think they also had one in the winter of '64 when they were going to rescue the Kiwi doctor at Cape Hallett that had burst his appendix. As I recall it was May, 1964. And there was some chatter, and the Soviets -- everybody listened to the radio chatter -- and they didn't, they didn't. But there was a radio guy that I took up to the hill because I had -- my old Polecat would run better than their stuff, and I could get him up to the, on top of the hill. And he would chat with me. And he told me that there was a sub, that they were bringing a sub in to get the guy. But everybody knew not to talk about it because it was against the treaty. And they didn't get the guy.

GERALD KOOYMAN: What happened to him, did he survive?

PAUL DAYTON: He survived, but I mean, that is a nasty story. Because at the time they had two R4D pilots and two helo pilots wintering over to go to Hallett or to Byrd for a serious medical e-vac. And I'm wintering over, and I'm out on the ice all the time. This was in late May. And you know, you could see everything in the middle of winter even without a moon. There was plenty of light. And the weather was just clear. And I couldn't even get those guys out of the boardroom to go out on the ice to see how easy it would be to fly to Hallett. I volunteered to go with them, and this poor guy was dying up there with a burst appendix. They wouldn't do it. He was a Kiwi. Maybe that was --

GERALD KOOYMAN: I don't know, it's a funny thing about that.

PAUL DAYTON: And he had got into some sort of emergency position where he was all curled up for several months taking all sorts of antibiotics, and they isolated it in a little pocket and he survived. I bet he remembers it if he is still alive. I remember being really pissed off at those pilots. They sure could drink, but they just lived in the --

GERALD KOOYMAN: This was in May?

PAUL DAYTON: May of '64.

GERALD KOOYMAN: There were no planes, but they actually had planes down there?

PAUL DAYTON: They were there to fly. That's why they wintered over.

GERALD KOOYMAN: Yes, that -- I didn't know they had a flying program in the wintertime.

PAUL DAYTON: They did. In fact they flew me to the Dry Valleys several times after the ships left to check Tom Berg's station in Taylor Valley and to go to Lake Penny and Lake Pewe looking for Gressitt's springtails. And long before the season opened they flew both the R4D and the helo, in fact, they took me out to Taylor to Berg's site in early September and left me there for several hours while they took some stuff up to the hut. So they did fly, but not in the dark.

GERALD KOOYMAN: So there have been precedents set, because there had been talk about trying to get a winter program going again where you don't have to stay all winter.

PAUL DAYTON: It's that easy to fly, I mean --

GERALD KOOYMAN: Well, what they have set as a standard is the end of civil twilight, and they won't fly anymore. So that's somewhere, I think, around mid-April.

PAUL DAYTON: Well, I don't know. But anyway, I'm finished. We've gone through all my questions. Did you have anything you wanted to leave for posterity?

GERALD KOOYMAN: I don't know if you want to carry it over all of those decades. As far as I know Art DeVries and I are the only ones that have spanned five decades in the Antarctic. Art has been continuous. I don't know that he's ever had a break from his Antarctic work, and his incredible endurance as far as going on for that long. I've had numerous breaks and gaps, but we started at the same time. And we are both still active. I don't know if Art was down this year or not. But I was down last year, and he was down there. Last year meaning 2010, not 2011. And Art was down there then.

PAUL DAYTON: He's got a picture of the three of us.

GERALD KOOYMAN: Is that right?

PAUL DAYTON: Yes.

GERALD KOOYMAN: But anyway, so the evolution of how -- of what has happened, it would be hard for people that are recent arrivals in the Antarctic in those programs to, I think, even envision what it was like early on. And how much has changed. And I guess the major factor -- but that is worldwide for everything, maybe it's not so hard -- that's communication. The idea now that the people are disgusted if they can't do their e-mail in their so-called remote camps out on the sea ice. I don't think Paul (Ponganis) had e-mail at Cape Washington this year.

PAUL DAYTON: No, he didn't. I know, I tried to get in touch with him.

GERALD KOOYMAN: Oh, you tried to reach him? Okay, but he had an iridium (satellite) phone. And you know, it took us years to try to get them out of these Southcoms. And they just wouldn't do it. They still insist you take a Southcom. with you even though you, you're not going to use it. A Southcom is an HF recorder, it's an HF radio so that you can communicate to McMurdo Station no matter where you are in the Antarctic. They stream them out, and since you do the various treks, sometimes you can't reach McMurdo, so you will call the South Pole and they relay it. And things of that nature. And you can't be left in the field unless you have communications with them on that radio. And that was a major anathema for me on the remote camps, on Cape Washington and all, because they would insist that we have to communicate.

PAUL DAYTON: I got arrested for not communicating when it wasn't my fault. They came over and busted me and hauled me back and made me stay at McMurdo to get chewed out. The damned radio did not work.

GERALD KOOYMAN: Well, that's because -- they were going to do that. I mean, I will tell one story about this because it is so good. We always had problems with that, and I kept saying that the radios are cold soaked, and when they are cold soaked they won't work. No, no, no, they will work, the radio people and the electronics people would say they would, and so they would insist on us taking it. And I said look, we'll call you the next morning once we've got the camp set up and the one room warmed up, and we've got the radio in there and it will be fine, but right now the plane is right there, we can tell them we are fine and we can go back, and they would say no, you've got to communicate. So we just did battle on that.

So one time we got put in at the Cape, but the ice was so rough out at the Cape that we were six miles into the interior, and it was extremely rough ice getting back and forth, so we were carting stuff back and forth from the twin Otter. So fine, we will call. Well, the radios were soaked and we could not get through. But we kept working and sort of forgot about the Otter, we thought the Otter had left. And just left the gear there. And so we made a run back and we left the one -- there were four of us that were going to be there, one was at McMurdo to see the things got out there. And then one was the Frenchman we left at the Cape. Well, Paul and I drove back to the cache where the Otter was. And lo and behold, the Otter was there. And we thought what the heck is the Otter doing here. And one prop was turning. And they had been there for several hours waiting for us to come back.

And they said we've got to take you back to McMurdo. And I said why? And they said because you haven't communicated. And I said the blasted radio doesn't work, I said we can't communicate. Can we call tomorrow when it's warmed up, when we have the camp set up. We were still trying to get stuff there so we can set it up. No, we've got to take you back now. And we said well, we can't go, we've got a man out on the Cape. And he said, oh, I can't stay any longer, I'm going to run out of fuel. And so in the end he said we have to leave. So we're going to leave you there. But I think there is going to be trouble. And so they left, and we just cracked up. One of the smartest things we ever did was to leave Patrice -- and it was a Frenchman, no less, it wasn't even an American. So we left Patrice at the Cape. So we put up more gear and went back and set up our hut, and it was a weather port and then we got the heater going and the radio in there heating so the next morning we could call.

So anyway, what we didn't know was that the plane flies back, Dave Bresnahan, who was in charge of it and recalled us, was out at the airstrip with Phil Thorson [phonetic], who was the other person in our camp. And he was driving out there he said, you know, I really hated to do this to Jerry. He's really a nice guy and all that, but you know, we've got to have communications. And then as the plane pulls in he's sitting there with Thorson in the warm truck waiting, or whatever it was they were driving. And the plane flies in, and he looks in, and says where are those guys, are they lying down and hiding? He said, "Those bastards better be in that plane!" And then he went from a nice guy to just fuming.

So the next morning we called in, "Checking in, everything's okay." And so they brought Thorson out and we went on with our business and that was the end of it. I got chewed out when I got back. But that was a month later and everybody had cooled down by that time. But now, even after we had the iridium phones, I would say give us an iridium phone and we will call you on the phone. No, can't do it that way. But you know, things move slowly. So now you check in with an iridium phone. You don't mess with the Southcom. But as far as I know in 2010 -- I don't know about 2011, I haven't asked Paul -- all the check-ins in 2010 were done on an iridium phone with unlimited minutes, so I was calling home and talking to my wife from time to time.

And that turned into a wonderful thing, because she had a medical problem while I was out there. And I would have never known about it. So anyway, we straightened out that. But anyway, we still had to have the Southcom there. Never used it, but it's a backup for the iridium. Because supposedly you can't trust the iridium. Well, the iridium is far more trustworthy than the Southcom.

And I can say that I am hard of hearing in one ear because of the Southcom. I went to turn it on one afternoon to make contact with a twin Otter that was flying in, I was going to call him and give him the weather. And I went in and I turned the radio on, everybody else was out of town, they were out on the ice edge. I turned that radio on, and you know how you reach down, and so my head was like this and the radio is here, I flipped the switch and it blew up. Just ka-BANG! And I couldn't hear anything, I couldn't hear -

- and I ran outside and shouted -- I don't know why I went outside to do that -- but I ran outside and shouted as loud as I could, and I could not hear myself. And I said oh, man, I have lost my hearing. So after a few hours my hearing came back. But it never recovered in my right ear. And actually, I wasn't aware of that until several months later I realized that I was hard of hearing, because I kept thinking the phone in the office had a lot of static in it. And then I switched ears, oh, it started to work now. It took me a while for it to dawn.

But in any case, the builders of the Southcom are here in Escondido. Well, they put out an all points bulletin to not use those radios for a few days until they checked them out. And they claimed that that radio cannot blow up, there is nothing in it that they can blow up. So they thought well, maybe some gas leaked in it from propane or something. But these are sealed, they are watertight units. And it blew out from inside. And when the twin Otter pilot came into the tent, we were going to give them some stuff, and he came in after it had blown up, and he said wow, the radio was bulging all around. It didn't fly apart, it wasn't exploded, but it inflated the whole walls of that whole Southcom. So he took it back with him, and they sent it to the factory and they checked it out. And they still claimed that it can't be done, can't blow up.

PAUL DAYTON: When I went, and when you were there too -- if you wanted to talk to home you had a phone patch with some lady at Rancho Santa Fe.

GERALD KOOYMAN: Betty Gillis in Rancho Santa Fe.

PAUL DAYTON: Betty Gillis in Rancho Santa Fe, who would patch you through on a ham radio, and you had to say "over" to your family. And I could never get it, I never got one.

GERALD KOOYMAN: You never got one? Oh, that was an experience.

PAUL DAYTON: That was the only way we could communicate.

GERALD KOOYMAN: Yes, when you were at McMurdo the only way you could get a message home other than occasional mail --

PAUL DAYTON: And this poor lady sat there in Rancho Santa Fe --

GERALD KOOYMAN: Well, the ham operators, they just love doing that sort of thing. And so you would walk down to the radio shack, the ham radio shack at McMurdo, which is different from the rest of it, and you would wait in line there. And you would sit there for a while and listen to everyone else's phone conversations, as well as the rest of the world could be listening to them. And you are listening to the person that is the most important person in the world to you, and you --

PAUL DAYTON: I tried a few times but --

GERALD KOOYMAN: Never got through?

PAUL DAYTON: You could write a letter, and it would be a month before you would get an answer to your letter. A full month.

GERALD KOOYMAN: Yes, that's why I say that the communications is probably the major evolution of things.

PAUL DAYTON: Now you can just send an e-mail, you can iChat.

GERALD KOOYMAN: You can do it on -- well, can you do Skype or iChat?

PAUL DAYTON: Well, they don't like you to, because --

GERALD KOOYMAN: It takes up too much of the band, doesn't it?

The whole evolution is remarkable. And one thing I did mention in all of this, and Paul is aware of this too, he was there early enough for that, is the first woman to come to Antarctica in that program was in '69.

PAUL DAYTON: Was it '69. They were nuns as I recall. Margaret McWhinnie [phonetic] and her nuns.

GERALD KOOYMAN: No, McWhinnie -- I don't think she was the first, I think it was a geology teacher that came, and they kept her in a field camp out away from McMurdo. And they would fly a helicopter over and bring her back once a week for showers. Can you imagine the cost for that?

And then they had -- well, actually Christine Mueller- Schwartz was also there with her husband out at Crozier. But they were all in programs where they were isolated. And then they said well, they've got to fly them all to the Pole. So Christine was all for going to the Pole, but she did not want to go unless her husband went. No, no, no, can't take the husband. So she didn't go. So they took them all in a C-130 to the Pole and it was a farce. They had to say well, who is going to be the first on the ice? So they have a photo of them, and what they finally decided to do is that they all hold hands and jump off of the aft end of the C-130 at the same time.

PAUL DAYTON: You know who was the first one, the first person after Scott Amundsen to step up there, at the Pole?

GERALD KOOYMAN: Step up where?

PAUL DAYTON: At the Pole. Dufek. Admiral Dufek.

GERALD KOOYMAN: Is that right, they flew him in and --

PAUL DAYTON: Que Sera, Sera. Well, I mean, he was on the flight, and he was the first one.

GERALD KOOYMAN: Is that right? Well, do you know what happened to the Que Sera, Sera?

PAUL DAYTON: Yes, the tail is in one of my photos.

GERALD KOOYMAN: Yes, they just put it out on the ice. It should be in a museum.

PAUL DAYTON: Well, they took the wings off it and they were running it back and forth to the strip. And then something happened to it, and they just pushed it out there.

GERALD KOOYMAN: There was no sense of history, really, other than -- although in '61, the one thing they did was there is a major flight to the Pole. And all of the philatelists were going nuts so people were taking stacks of envelopes with them that were going to be postmarked at the Pole in celebration of Scott Amundsen, of him getting there.

PAUL DAYTON: We need to do the women on the ice sometime in more depth. Because it is pretty interesting because -- when I wintered over in the '60s, I thought of nothing but sex. I was obsessed.

GERALD KOOYMAN: Well, how could you help it with all of those Playboy magazines --

PAUL DAYTON: I really truthfully and honestly wanted a woman on the ice with me. But you know, at the same time the Seabees were just drunk louts, they were scary drunks.

GERALD KOOYMAN: Who?

PAUL DAYTON: The military guys, the enlisted guys. You know, they would come crashing into buildings and things. So I realized that everybody said it's our sailors, they will rape them. And that's why we can't have women on the ice because we can't trust our sailors. And I remember arguing with that, with Capt. Riley that you should be able to control your sailors. And catching a lot of flack about me being a civilian and things. But it was an ongoing argument held at fairly serious levels, because it was clear to me then that if we had women there, these guys wouldn't behave like that. And that they would be really okay.

And then in the '70s we were in building 225, it was that white building --, and it was up by, on the hill. And they had -- it was clear that they, somebody had set that up, and I like to think it may have been Llano and some of the earlier, you know, those people high up, to have women. There were separate toilets, separate showers with privacy in

that building. You know, so I think at some level they were preparing for that in the mid '60s. And then you say the geologists were '69?

GERALD KOOYMAN: Yes.

PAUL DAYTON: But the first one really to winter over was my student's wife, Donna Oliver.

GERALD KOOYMAN: Oh, yes. What year was that?

PAUL DAYTON: That was '75 or '76.

GERALD KOOYMAN: So she was the first. Was she the only one that year?

PAUL DAYTON: Yes, she wintered over by herself with Oliver. And all of the things I thought in the '60s turned out to be quite true. As soon as she was there, the whole place cleaned up. And it was a normal village instead of a drunken place.

I remember that she was all geared up to go and the NSF decided not to take a chance on her, and Llano had to tell me -- and this is when they were firing Llano -- that well, you can't do it. And I said, you know, sorry, George. The laws have changed. And we are going to have to just go into the courts because I don't think you can do this anymore. And he said well, I was sort of hoping you would say that.

GERALD KOOYMAN: Is that right?

PAUL DAYTON: Yes. So he reported to people who are pushing him out, a guy named Andrews or Ed Todd, no, you can't do it, Dayton's all geared up to sue you, and if she doesn't go down there, we are going to have a nasty lawsuit. And they let her go. And she wintered over just great.

But there was McWhinnie who was at DePaul University who went down on a winter flight before that I think, maybe in the 60s.

GERALD KOOYMAN: She never overwintered?

PAUL DAYTON: She didn't overwinter, she went down in September. And I think she had three nuns with her. So in some sense she was the first to come down there in a winter situation. And I don't know too much about that.

GERALD KOOYMAN: I don't either, I wasn't there at the time that she was there.

PAUL DAYTON: She was at DePaul. And so they were real nuns. In their habits. Well, can you think of anything else?

GERALD KOOYMAN: Oh, I can think of tons of things. That's easy.

Oral History with John Pearse, Jack Littlepage, and Paul Dayton. 4 February 2012

PETER: It's February 4th, 2012, and I'm Peter Brueggeman at the Scripps Institution of Oceanography Archives. Please introduce yourself by name and affiliation for voice identification.

JOHN: I'm John Pearse and I'm with the University of California Santa Cruz, retired.

JACK: I'm Jack Littlepage with the University of Victoria in Victoria B.C., retired.

PAUL: I'm Paul Dayton, I'm at Scripps and I'm retired.

VICKI: I'm Vicki Pearse and I'm married to John. University of California Santa Cruz and Stanford University, and I didn't get to retire.

PAUL: Maybe each of you could just talk about how you got involved in the very beginning, before you went to high school, and, college. I know something about John, because he was in Tucson like me, but I know nothing about you, Jack.

JACK: Maybe a good way to start is to say how old we are because that gives a time line. I'm 77 and I went to Chula Vista High School, just south of San Diego. I was well on my way to being a juvenile delinquent until I got tangled up with the museum. I was terribly bored in high school and I got involved with the San Diego Museum of Natural History, which opened thousands of doors for me. I worked there from my junior year in high school, through my senior year in undergraduate work. I did my undergraduate studies at San Diego State, and worked on weekends out at Scripps, generally with Carl Hubbs or earlier than that I worked with Ken Norris and Connie Limbaugh, doing diving trips for Carl Hubbs, collecting fish off of Scammon Lagoon, Cedros Island and other locations. Then I went to Stanford; that would have been 1958. I met John Dearborn there, and I think you came the next year, didn't you, John?

JOHN: Actually I came in 1958, you must have come in '57 or '56.

JACK: No, I graduated from San Diego State in 1957 so it would have been the fall of 1957 when I came to Stanford. My major professor was Donald Abbott. After the first year at Stanford I went down to Hopkins Marine Station in the summer of 1958.

JOHN: I went down first time in 1959. I went down and lived on Granite Street with Bill Austin and his wife, Diane, and George Cooper, Michael Soule, and George Araki. We all lived together that summer.

JACK: John Dearborn and I did a lot of collecting for Don Abbott for the courses we were taking the summer of 1958. And, then, we went back to campus. John went down to the ice at that time, and I didn't know Curly at that time.

PETER: Curly is Donald Wohlschlag, who ran the Antarctic program for Stanford.

JACK: John Dearborn went down. And he came back, after his, oh, ... let me get this square. I knew John before he went down and he told me about the Antarctic and what he was doing. So I was familiar with the program that he was going to be doing in the Antarctic, and I must have met Curly, Donald Wohlschlag at that time. John Dearborn went down and then I approached Curly to see if I could go down, because I had not really found a good project that I liked in Don Abbott's area, and going to the Antarctic appealed to me. We also got paid for it... rather well, and that was an incentive, because I was like all graduate students, stone broke and looking for money. So I made the approach to Wohlschlag, that I go down as John's field assistant to see what it was like down there, and see if I could do any research down there. So that was how I got involved with the program. Definitely, I went to Wohlschlag and asked if I could go down and help John Dearborn with his work.

JOHN: That would be the end of 1959, right? Fall of '59.

JACK: Yes. Because, January 1959 John Dearborn went to the ice. And August, I went to a USARP orientation in Virginia.

PAUL: U.S. Antarctic Research Program.

JACK: Yes, the very first orientation session that they had in Smoky Mountains, ... Skyline and Smoky Mountains. They issued us clothing and everything, this is before the God awful USARP jackets which were totally useless. We got some very nice military clothing to wear, it was heavy but it was very functional. Then in October, I took a MATS [Military Air Transport Service] flight from Travis Air Force base down to Christchurch and then stayed in Christchurch and then Super Connie [Lockheed Super Constellation aircraft] down to the ice and I arrived on the ice, mid-October, in 1959. John Dearborn was there, and he was there all alone, trying to do his work. It was extremely difficult. How John Dearborn managed to do what he did, it was just unbelievable.

PAUL: You guys might give a hint, what John Dearborn really had to do. I always wondered what happened to poor John. He must have got off a boat or plane and there it was, just ice, and he was supposed to do benthic ecology under the ice.

JACK: That's right. John Dearborn built the first ice house. He built it out of just packing crates. There was no insulation, no electricity, nothing,

JOHN: Just a box to keep him out of the wind.

JACK: Most of his work was just out in the open, through an ice hole. As far as equipment goes, as I remember, he had an ice chisel, which was a long piece of steel with a sharp point on it.

JOHN: How did he make holes?

JACK: He used seal holes and he blasted. Mostly seal holes, I think. He did some blasting. He had no winches; he had rope, wire to make nets and traps.

JOHN: He had the hand winch.

PAUL: That came later.

PAUL: You guys are in a lot of those pictures, that may have come later. That would have been a little tiny thing:

JACK: Transport was by a weasel [tracked vehicle] when it ran. He had nothing... just amazing what he managed to do.

PAUL: Do you know anything about how he was asking his questions, how he decided what to try to do?

JACK: I was not privy to that. Because we didn't know, the questions like, when I went down which was a year later, is there any plankton there? Is it going to be there in the winter? We had the scientific reports from the Scott Expedition, and that was all the information that we had. We knew it was there in the summer, but that was it. So the questions you asked were very simple.

PAUL: I've looked at the old Scott / Shackleton expedition scientific reports, and they collected things and they told you how to do it, but they didn't tell you where things were.

JOHN: No.

PAUL: So John Dearborn wouldn't have known anything.

JOHN: I think John Dearborn was just going down there to see what was there, what could he find? It was almost all by bottom grabs and traps.

JACK: Yes, he did a lot of trapping. The bait for the traps was seal meat; at that time there was a large dog pup colony down there that the Navy maintained.

PAUL: The Navy had dogs too?

JACK: Oh, yeah, they had dogs. They would go out and kill seals for dog food, and John Dearborn would go along and collect parasites, and stomach contents and bait for the traps. That's where we got the traps and that's where he got a lot of data for publication on food habits and traps from the Weddell seals and seal kills for the dogs. When I got there, I had no idea what I was doing. I was just on a lark to Antarctic to find out what it's like and help John. I introduced some things we were talking about to John, who was very good scientist but not very innovative in craftsmanship and those sort of things. He had nothing like a tripod,... he just pulled ropes out of the ice holes by hand and I said, this is not going to work. We built tripods and attached the rope to the weasel, and that made life much easier. So we didn't have to --

JOHN: He must have loved your help, because he had spent a whole winter doing that.

JACK: I know, it was terrible. I did it for about a week and I said, John, I can't do this. So he had nothing, he really did. The lab was not built at all, and he did, all of his work that first year in a Jamesway [hut]. By the time I got down there, in October of 1959, they had the lab buildings,... I think they were T-5 buildings or T-3 buildings. There was one built, and most of the equipment was buried in the snow outside. It had not been moved inside at all. And then there was no plumbing. Very primitive heating in there. I don't know if John actually ever worked in the T-3 that year; the next year he did. That first year, at best, his conditions were no better than Scott's, maybe worse.

PAUL: Probably worse. Yes.

JACK: Scott had pretty good conditions.

JOHN: Scott had working space on his ship, and then in his huts at Cape Evans.

JACK: When we were in his huts and things, we were amazed. They lived in relative comfort.

JOHN: But they didn't have much of a lab.

JACK: No.

JOHN: I think those guys going out there and collecting were doing about the same thing John was doing.

PAUL: I think so too. I mean, the pictures are the same. Their explanation and publications talk about not letting the rope freeze,... laying it out so you could walk it out and put it down the hole. Those were things that we all enjoyed too.

JOHN: The one thing which I don't think John ever did, was try to do dredging by taking the rope down a hole and hooking it from another hole like I think Scott's people managed to do.

PAUL: They used the crack in front of Hut Point, and there's always that tight crack there and they kept it open.

JOHN: So they could run the whole thing down through the crack?

PAUL: But they had a rope down there the whole time. So they were dredging that area right in front of Hut Point. That's the only place they dredged.

JOHN: Yes, I used to think about, how could you dredge? This would be interesting to do, because all we could do was just drop gear down a hole and grab stuff.

JACK: We did dredge at Cape Evans when the ice was broken, but not before.

JACK: John Pearse and I were talking earlier, and we think there were only two USARP people wintering over in 1958-59. They were the only PIGY people, post-IGY [International Geophysical Year, 1957-1958] -- Matt Pryor (?) and John Dearborn. I can't remember anybody else there. Looking at my notes, in January 1960, Will Tressler came down; he was the oceanographer that preceded me. He came down with a huge amount of equipment.

PAUL: Was he Navy?

JACK: Yes. U.S. Hydrographic Office.

JOHN: He came down with an assistant and a big house to build on the ice over his station.

JACK: His own T-3.

PAUL: That's the one that went out to sea.

JOHN: That's right. It went out to sea as the ice broke up in March 1961.

JACK: ... and a polecat [all-terrain vehicle] came out with him.

PAUL: My old polecat. That was Tressler's?

JACK: Yes, it was brand new when they came down. That must have been in January 1960. As near as I can tell, that was when we set up the Cape Evans trail, because Jack Long was a traverse engineer. That was the person who drove the snowcat and we towed it up with a trans-Antarctic snowcat.

JOHN: Where did the trailer come from, Curly got it?

JACK: Yes, so it had to be there. It came in by ship. We had to take it up on ice, so it couldn't have been too late in the season. It had to be early January that we took it up.

PAUL: Because the ice used to get rotten about then. So you guys got the trailer down there

JACK: John and I took the trailer. We were there when they took the trailer. Jack Long took it up, and I think some of the Seabees [US Navy] came up and put it on the skids and tied it down and all that stuff. Then John and I went up later that same year and stayed there for, I think probably a month. It was quite awhile, a long time we stayed there. That was when we dug a snow cave for a refrigerator, so it was stocked well with food from McMurdo. We had taken over what we thought was the radio shack from Scott's expedition. It was a little tiny four by four, four by six, and we had what they called an angry nine radio, which on good days could reach McMurdo.

JOHN: Could you get into Scott's hut?

JACK: Yes. We got in and it was just like "Doctor Zhivago" with ice crystals and everything. We must have been early ones in there because nothing was touched. Nothing was touched, and the pictures they show now, with everything on the wall, and they say this is like he left it. Forget it. You know, it was jumbled and ice.

PAUL: I've now read a lot about Shackleton's expedition and they're making do there and they left in a hurry, with food on the table. Did you see the meal on the table? When Shackleton came down to rescue the McMurdo party, most were living at Cape Evans, Ernest Joyce and Frank Wild had escaped and gone up to Cape Royds because they didn't get along with the others. Shackleton stayed for several days looking for the bodies of Mackintosh and Heyward. He made a huge effort to clean up the hut, because it was Scott's hut and everybody was mad at him for using it. So he made an effort to clean up the hut.

JACK: We were amongst the first in there. It could have been there because we didn't touch anything inside.

PAUL: Well, the Kiwis in 1961 and '63, cleaned that up and they still hated Shackleton with a passion in the 1960s. They erased those guys, and they put that building carefully back into the picture from Scott's mid-winter party. You guys were there before this happened and I would dearly love to see your pictures of the Cape Evans Hut! Now it's even different.

JOHN: You probably saw it before the Kiwis got back.

PAUL: That's right.

JACK: I remember sleeping bags on the cots.

PAUL: That's right. You didn't see that, but that's the pictures that you've seen, of the hut, and what you saw probably, even by when you got there.

JOHN: Right, 1961, I can't remember too much about it. It was dark and filled with snow and ice. The next time I went up there it was there the 1980s and it was all cleaned up.

JACK: I remember it was dark and there was a big radiator in the center, some sort of a cold fire oven.

JOHN: Oven in the center or stove.

JACK: But the sides were all ice, just covered with ice and you couldn't see very much. I know that unfortunately, I took one or two little cans of provisions, as souvenirs.

JOHN: Was the dog there?

JACK: There were dogs all over.

JOHN: There was that dog on a chain when we got there in late 1960 or early 1961.

JACK: That was at Evans. We had a dog at the lab too, that stood by the door, frozen solid until the admiral had a fit about it and made us take it down.

PAUL: I've read the history of Shackleton and then seen those guys erasing him, and that was going on when I was there.

JACK: Well, there were lots of parts of the tractors and everything scattered all over, fuel cans, all of those things were all around. There were some dead animals, dogs there, we didn't go in that much. We didn't really have that much time and it was difficult to get in. You couldn't go very far.

JOHN: It's also something that we respected.

JACK: That was, God lived there.

PAUL: Yes, yes, for me, too. So, now we got you and Dearborn, in this little trailer, for a month,

JACK: That's when we ate the penguin.

PAUL: That's when John Dearborn was taking his airplane gas tank out?

JACK: Yes, it wasn't a gas tank. It must have been a navigation port or something, off of something like a DC3. It was angular, and six feet long, something like that. We tied it, had a rope on one end and John went paddling out into the bay at Cape Evans, that was before he was out on the life raft. I think it was the thing, when you look through the sky, when they're navigating, they have sort of a triangle thing on top. I think that's what it was. We got out there.

PAUL: So he used that make-shift boat; tell us what he did with it.

JACK: He went out and he was having to use an orange peel grab. He would put a dredge down and we'd pull it up to the beach. General collecting, we put traps out. He made one and didn't go far offshore. Maybe 30 feet out or something. We had a short rope, and he wouldn't go out without a rope on the boat.

JOHN: It was open water.

PAUL: So you got picked up with a helo.

JACK: We drove up several times by weasel or snowcat, but on this trip, by helo. Chopper came in. And can't remember, John must have taken all the collections back, but we had all the collecting materials you would want at that time. Then materials started coming in, so we had alcohol and formalin and all the bottles and everything to collect. I remember working in the lab, and we thought it was quite comfortable, until we tried to drink some water, and found the water was frozen solid, but, we had been down there for a while, and freezing temperatures were sort of normal. Those were good days in Cape Evans, I did the cooking, as I seem to have done all my life. Worked hard. There was no spare time, I can tell you that, when we were there.

PAUL: Let me just go back just for my own curiosity. You said that you went from Christchurch, and did you stay on the base in Christchurch?

JACK: No, we were very fortunate. We stayed in one of the main streets along the River Avon. And we were in a commandeered Salvation Army type of

thing. At one time, it was a dormitory for unwed mothers that somehow USARP had gotten ahold of it and that's where we lived. In the time when it wasn't being used by USARP, it was advertised as a bed and breakfast with central heating. The central heating was one little tiny fan in the middle of a huge room and the ceilings were about 20 feet tall. The only restriction we had was that we had to be within 24 hours of the airport in Christchurch Harwood. Other than that, we could do anything we wanted. I traveled all over New Zealand and phoned in every day. I guess I had about two weeks of free travel. I paid for it.

PAUL: Was Margaret Lanyon there then?

JACK: No. It was Goodall.

PAUL: Eddie Goodall?

JACK: Yes.

PAUL: He was there when I went, too.

JACK: They were very good, you know, very good.

JOHN: Very good.

JACK: Check in each day and we'll let you know when to get to the airport.

PAUL: You were waiting for weather?

JACK: Weather.

PAUL: Then you said you flew a Connie [Lockheed Constellation aircraft]?

JACK: Flew in on a Connie.

PAUL: Do you remember a Connie crashing in that area?

JOHN: It was the next year, in October 1960.

PAUL: They must have had three Connies then because they had two that worked through the '60s that I rode on, both of them. This must have been a third Connie.

JACK: There's a picture in one of the Operation Deep Freeze yearbooks. It was the flight before us in October 1960, that crashed. No one was killed. It sort of split in half on landing.

JOHN: But that was the second year.

JACK: That was the second year.

JOHN: When we were waiting in Christchurch some of the survivors came back to the hotel and talked about coming in to land and watching the fuselage separate in front of them, and looking down at the snow being stirred up.

JACK: Back to the previous year, in late 1959, Stoner Haven came in to McMurdo, and his job was to set up the lab. I think by the time we left in January 1960, they probably had the other section in, I'm sure they had the other section of T-3 built and they may have had the connection between the two, the plywood connection. They didn't have the plumbing and stuff in at that time, because they were still doing that when you came down, the snow melter and things like that. I think they just had the two sections.

PAUL: So you and John went out on a ship that year?

JACK: No. I flew out.

JOHN: Yes, we went out on a ship the next year, in January 1962.

JACK: I flew out on a C-130. I remember because they had a bet on who could get through Christchurch the fastest. Was it a C-130 or a Connie? I was fortunate to fly in an observer cockpit of the C-130 when we flew, because I liked airplanes. We flew high so we could go faster. We were trying for time, and the pilot just went zoom and then we went straight down to land. I'll never forget that flight.

PAUL: And you won.

JACK: We won.

PAUL: By quite a bit.

JACK: Yes.

PAUL: So, you didn't think about doing oceanography in your first year, you were just helping John Dearborn?

JACK: I was looking to see what could be done.

PAUL: And Ollie Omundsen? and Tressler were doing oceanography?

JACK: They just got there in the fall of 1959.

PAUL: So you sort of knew when you came back what you were going to do, and more or less what those guys had seen?

JACK: I didn't know what Tressler was going to be doing at all. I'm surprised that I actually did so much physical oceanography. I must not have realized what Tressler was going to be doing because I had a physical oceanography program as part of my thesis, which turned out to be probably one of the most important parts of it.

JOHN: Yes, quite frankly.

JACK: Tressler's data, considering the resources he had, was very skimpy.

JOHN: Your paper is the one that is a benchmark paper, not Tressler's.

PAUL: There was a Kiwi program, too, but it had some current meters of some sort.

JOHN: That was down at Scott Base, just off Scott base, that was trying to determine whether the water was going in under the Ross Ice Shelf or out from it, right?.

JACK: That was early. I think that was very early. But when I returned in October 1960 to do my thesis work, it was decided that I would be doing physical oceanography in support of my plankton project. So I must not have known exactly what Tressler was going to be doing at that time [in 1959-60]. When I left the first time, in January 1960, I had made up my mind that I would be doing a plankton project. The physical part of it... the questions, were not esoteric. It was "are we going to find plankton in there?" I remember, writing up my thesis proposal, one of the questions, is there plankton underneath the ice year-round?

PAUL: Pretty good question.

JACK: It is a good question, and in retrospect there are lots of things I should have done, should have had more money, spent more. All of us had that feeling. But, by the time I left, in January of 1960, I had not only helped John Dearborn with his work, as a field assistant and I had defined what my project would be. Then when I went back to Stanford, the northern summer was spent just getting materials ready for the next trip down, in which I knew I would be spending a year and a bit down there. I planned to winter over.

PAUL: I was always wondering how you got into the plankton, in the physical sense, physical oceanography.

JACK: Sort of by accident.

PAUL: Well, but you were there, and you were asking those questions and you were interested in plankton.

JACK: Yes, and we had no information on temperature.

PAUL: You were an Abbott student, not a Curly student.

JACK: Officially an Abbott student but in effect, a Curly student.

JOHN: Neither of them knew anything about plankton,

JOHN: Although Abbott was doing the CalCOFI stuff.

JACK: In addition to that I did plant nutrient work and light, and I think probably in the design, the physical oceanography, temperature, salinity was ancillary. I needed the data and it became a big thing. We're getting into the next year now, but when I left the first time, in January 1959, that was my intention, just to do plankton.

PAUL: Should we shift to John Pearse, because you've covered a whole area that I didn't know.

JOHN: So you covered the 1959-1960 summer, and now we are going to the 1960-1962 year. I'm 75 and my background is, I went to high school in Tucson, Arizona. Like Jack Littlepage, one of the defining things for me was working my last two years in high school at the Arizona Sonora Desert Museum, where I built trails and exhibits, collected specimens for the exhibits (mainly snakes and lizards), and cared for them.

Because my father was working for the U.S. Aid program in Egypt, after high school I went to Egypt for one year, and attended the American University in Cairo. Living in Egypt was an eye opener for a kid from Tucson, both the culture there, and the desert environment, especially along the Mediterranean and Red Sea coasts, where I got my first taste of marine biology. There was no biology program at the American University in Cairo, and I wanted to be a biologist. So after my freshman year I went to the University of Chicago. My father had graduated from the University of Chicago, and he could get me a scholarship there. He told me that he would never ever recommend that anybody go to live in Chicago, where he grew up, but then he said, his brother lived there and I could live with him and we could get a scholarship for me, so being an obedient son, I went to Chicago. I wanted to be a biologist, primarily a desert biologist, but living in Chicago, the main thing I wanted to do was get out of Chicago. I liked the University, it was a very good school and the classes were challenging. However, at that time the faculty did not encourage their better students to leave if they were going on to graduate school, saying there's no school as good as Chicago. I must have been a good student because they let me know I should stay there for graduate work

(besides, most students were pre-med, so there were not many of us majoring in zoology, three in fact). I had become fascinated with marine invertebrates in my classes. When I realized they did little work in marine biology at Chicago, I said that is what I wanted to do graduate work in, and they allowed that I might want to go to a university of the coast, such as Stanford.

JACK: It's interesting that both John and I started out as probable herpetologists, both working in the desert. Very similar, both at museums, very similar background.

JOHN: Just like Paul, who also was raised in Tucson.

JACK: Then we banged together over invertebrates.

JOHN: That's right. Then in the fall of 1958, after spending a wonderful summer at the Marine Biological Laboratory in Woods Hole, Massachusetts, I came to Stanford with no professor in mind, nothing in mind in fact, except that I wanted to work in marine something. My first choice was actually going to Hawaii, but Stanford gave me a better offer. When I got to Stanford I was assigned to be Don Abbott's student. In the spring of the first year, I took a seminar run by Arthur Giese on reproduction of marine invertebrates. He had just written a big review on the topic. It was kind of a boring seminar, with students droning on, but the topic was very interesting and it caught my attention. I told Don I was interested in looking into invertebrate reproduction, particularly reproductive cycles of marine invertebrates. Don said I should sign up with Giese, particularly because he already had too many students, so I switched and my major professor became Arthur Giese. Don remained on my committee, and was always very supportive and helpful. At the end of the seminar, I heard about the idea that temperature controlled the timing of reproduction of all marine invertebrates in general, so species that spawned in spring and summer responded to increasing temperatures, while those that spawned in the winter responded to decreasing temperatures. This idea was known as Orton's rule after an Englishman who first formulated it. A corollary was that if a species was in a place where the temperature was constant throughout the year, reproduction should be constant throughout the year. Therefore, in the Antarctic and Arctic, as well as the deep sea and the tropics, where temperature is constant throughout the year, reproduction should be constant throughout the year. That seemed improbable to me, particularly in polar regions where everything else is very seasonal.

PAUL: You knew that?

JOHN: You thought you knew that.

PAUL: Yes.

JOHN: But that paradigm had already been pretty well established. MacGinitie had gone to Point Barrow, Alaska to look at reproduction in animals there. He said most things did reproduce throughout the year, although he found exceptions. When I heard about the Antarctic program from Jack and John after they returned in early 1960 and talked about it, I thought I might be able to look at the problem there. Jack and I were living together in 1960 on College Avenue in Palo Alto with several other people. I was told that Curly was looking for people to go to McMurdo that fall. I went to see Curly sometime in early 1960 and said I'd like to go down. Next thing I knew I was on my way to McMurdo. It was very fast. It was one of those kind of decisions I didn't really make. I just inquired and bingo the decision was made.

PAUL: So you went up from Hopkins?

JOHN: No, I was at Stanford in Palo Alto during my first two academic years there. I got there in the fall of 1958, took classes, including Giese's seminar in spring 1959. That summer, 1959, was my first summer at Hopkins Marine Station, when I took Don's invertebrate class, then I returned to Palo Alto, for the 1959-60 academic year.

JACK: John Dearborn and I were at Hopkins at the same time, in the summer of 1958. That was the only summer I spent in Hopkins. John Dearborn went to McMurdo that fall, and I joined him in the fall of 1959. We returned to Stanford in early 1960.

JOHN: I met John Dearborn in 1960, after the two of you returned from that first time at McMurdo. You and I must have known each other my first year at Stanford, 1958-59, I don't remember, but John was at McMurdo then.

PAUL: And you went to talk to Curly.

JOHN: I talked to Curly.

PAUL: And he was gearing up for the Antarctic field season at that point.

JOHN: At that point. That would be the winter-spring of 1960. The summer of 1960 I went back to Hopkins and was the T. A. for Otto Kinne's ecological physiology course. That fall we went to McMurdo.

JACK: Well, we didn't get down there until October.

JOHN: That's right.

JACK: I spent most of 1960 building ice houses and things of that nature, at the shack at Stanford.

PAUL: You said that was at the net loft?

JACK: Yes. The net loft was a series of buildings, somewhat, at that time, off campus. It was a lot of space to do the sorts of things we needed to do to construct the ice houses. This was all done by contract. Curly had contracted some people to build the houses and we just told them what we wanted and they built the houses. We also built or had contracted to build winches and things to use, to do the collecting.

PAUL: Was F. J. Thomas on the scene at that time?

JACK: No.

PAUL: So Curly himself was contracting the people to do the work

JACK: The net loft went back to the Te Vega expeditions and it had oceanographic gear and the offices were in one complex.

VICKI: Te Vega started in 1963.

PAUL: That may have been CalCOFI then. There were fish collections galore. There were tropical fish and there was a professional artist.

JACK: He had two buildings and fell out of favor, for a number of reasons and left Stanford.

PAUL: So it was a big work area.

JACK: Big garage.

JOHN: It was way out in the boonies from Stanford.

JACK: Beautiful parking, just drove up and parked.

JOHN: By the end of the summer of 1960, I was all set to go, and my plan was just to go down and find some animal that I could work with for a year to find out whether it had seasonal reproduction. It wasn't anything much more focused than that. I also was all geared up to do a lot of biochemical work, lipids, proteins, and carbohydrates, and how they related to seasonal cycles, because Giese's lab did a lot of that kind of work. I flew, out of Travis Air Force base. I was engaged at that time, and my fiancée took me to Travis. I flew away to Christchurch, New Zealand, and met Jack there.

PAUL: Did you have to stop for fuel?

JOHN: I'm sure we did, probably stopped in Fiji.

PAUL: When I went on the Connie, we stopped several times.

JOHN: I think Fiji was the main stop, on the planes going both down and back, but we also might have stopped in Hawaii. So, we flew down, got to Christchurch, had the same thing Jack had the time before. It was very stormy at McMurdo, so we couldn't go down. We went all over New Zealand with a rented car. We went to the west side of New Zealand, got to the North Island, Rotorua, about as far away as we can get and still think we could get back in 24 hours when we got the call saying we needed to be back in Christchurch within 24 hours. We had to run all over the place and had to get another plane to get back. They were concerned that we were a little too far away to get back in time.

PAUL: At that point you were in North Island.

JOHN: We were up in Rotorua, nearly the center of the North Island. As I recall, we had to get a special flight to Auckland, and then fly to Christchurch. But we made it.

PAUL: And it was the two of you, and John Dearborn wasn't there.

JOHN: That's right.

JACK: John Dearborn came later.

PAUL: So then the two of you got on a Connie?

JOHN: We got on the Connie and flew down. And when I got down there, I didn't know anything. It was all new to me, but Jack had been there before, so I just followed Jack around and did what he told me to do. First thing we did was put in some houses, and we blasted holes and that was one hell of a lot of work.

JACK: Not too effective.

JOHN: Not very effective. The mound of brash ice that came up after the blast took you two days to shovel out, and then you had a hole you couldn't use well anyway. Then we got into chain saws, which I thought was really the way to go. When I went back in the 1980s, I tried to show people how to use the chain saw, and they were all drilling holes with huge circular drills. They thought I was crazy, and I had to agree; cutting holes with a chain saw is a lot of work.

JACK: I have pictures of John cutting a big hole, in your station, we could barely see John sticking his head out of the ice.

PAUL: So this is your first year.

JOHN: We blasted at the beginning, and then used a chain saw.

PAUL: It's technically interesting, because, to blast a hole, you've got to actually have the dynamite down a drill hole.

JOHN: No, we had shaped charges.

JACK: I was the chief blasting officer.

PAUL: And you made a big cavity.

JOHN: That's what the problem was, the edge was uneven and difficult to work around.

PAUL: And maybe a tiny hole at the bottom.

JOHN: There was plenty of a hole, but it froze up.

JACK: What happened was frazzle ice came up by the tons.

JOHN: Frazzle ice, it's all the soft ice on the undersurface of the sea ice, which came up and filled the hole and all the broken ice that fell back in the hole after the blast; digging that stuff out seemed never ending. We have some great pictures you standing in the middle of that stuff, Jack.

JACK: That was terrible. Also the shaped charges produced a huge black spot. Then, the holes started to melt around the outside, and it was just unsatisfactory. We'd talk about, blast supervision and stuff. I grew up part time on a farm, and we used to blast stumps and rocks and things, so I had some vague idea of how to use explosives. I was the explosive guy, and I just walked over to the Navy's supply store, and I said I want to blow a hole in the ice. They gave me packages of C3 explosives and fuses and all of the things one needs, and we went out and had a great time blasting holes in the ice.

JOHN: We were lucky, the metal stands holding the charges would fly by your head. That was pretty close. So we got the holes in, and we built little houses using plywood and beams in the Navy supply yard.

JACK: Temporary houses.

JOHN: We had pre-fabricated houses for wintering over, but we didn't want to put those out because the ice would go out later in the summer.

JACK: I don't think they were there.

JOHN: That's right. We had the ships coming down with them, so we built these little plywood houses. It was just two, or did we build one for John [Dearborn] too? I can't remember. I don't think so. I think --

JACK: Two was maximum.

JOHN: Yours and mine, and then John came down, he didn't come down until December or so. John, that first year when he was down there, he thought that was his year, and he came back to Stanford and talked to Don Abbott and said, this is what I have. I found these things down there, and Don says you don't have a thesis. John was getting ready to get married and got married, and then told his bride, well, I have to go for another year.

PAUL: Did he really think he had a thesis?

JOHN: I have no idea. But anyway, he didn't, at least Don wasn't going to take it. So John came back down, and he came down as late as he could, I think. He went out as early as he could, on the other end, and he let everybody know that he was not happy to be there for a second year.

JACK: The second winter was hard on John. It was really hard on him.

JOHN: He didn't like it at all. But he did do biology then and he worked really hard collecting.

JACK: He was an obsessive note taker. He taped everything, absolutely everything was recorded. His journals would cover absolutely everything in detail.

PAUL: He was always very stoic, talking anyway.

JOHN: He was not a happy camper that year.

JACK: It was interesting that both John and I had gotten married. I went down for the 1959 season, and then went back for the winter. So I was recently married, and John had just gotten married soon after we returned from his first year.

JOHN: I was supposed to be getting married. We had these weekly, or were they weekly or less than that, phone calls,

JACK: From the ham shack.

JOHN: And all of a sudden, my fiancée was never there to take my call, couldn't get an answer out of her. I would call and there would be nobody answering. Finally I called George Cooper, and he let me know that, oh, she's gotten married.

JACK: I remember that day. Not too thrilled about it.

JOHN: Not only she got married, she had been knocked up by Stoner Haven who we saw in Christchurch on his way out of McMurdo.

JACK: We had a tape recorder in the lab doing some musicals and it was about somebody, just like your situation, and so we used to always turn the tape off when you were there -- it was, too close to home.

JOHN: It was one of the luckiest things that ever happened to me, but I did not realize it at the time.

PAUL: Jack, you went down and you were looking for plankton, and you knew you had to do some physical oceanography. I'm quite interested in why you did such a terrific job of physical oceanography. I don't know how you, John, picked the most important species there.

JOHN: It was the most common thing there. We put the traps down and got three things actually. Lots of little stars in the shallow site. And in the deeper one, where, Jack was, 270 meters.

JACK: 283, I think it was the number.

JOHN: What we got in both of them were amphipods. So I thought, I would be an amphipod person. I collected amphipods all year long, and the stars too. I had two theses, and the third thing in the traps was a species of *Parborlasia*, a big nemertean.

JACK: I can understand why you didn't work with that.

JOHN: I had to get something that would come into the traps all year. And I was worried and rightly so, that I could start working on some animal, and it would disappear at one part of the year, perhaps it would stop feeding and wouldn't go to the traps, so I wanted to do work on at least two species. So I worked on both amphipods and sea stars, and I think I got more information on the amphipods than I did on the stars. I had two problems with the amphipods. First, they did disappear from the shallow station for part of the year. More seriously, I thought I knew what I was working with, and at the end of the season, in the austral spring of 1961, I bottled some up and sent them to the amphipod person, Des Hurley, in

New Zealand just to make sure I had the species identified correctly. *Orchomenella rossi* had been described, and that is what I thought I had. However, I was told that I had two species in my samples, one was *O. rossi*, but the other more abundant one was undescribed. Hurley gladly described it as a new species, *O. plebs*. However I had not discriminated between them throughout the year.

JACK: This is the last thing you want to hear.

JOHN: Right. So I still have those samples,... they're in my garage, among other things. I can distinguish the species, and I keep on thinking I'm going to write up what I found. Actually it is a good story, and no one has collected data like I have from that year.

PAUL: But you were with Giese, and you were almost predisposed to play with starfish?

JOHN: Well, sort of, yes. But you know, Giese worked on a lot of different things.

PAUL: But you got *Odontaster*.

JOHN: That was not because I thought it was a major species there or anything like that. It was coming into the traps for me to sample. I worried throughout the year about the identification. I thought it was *Odontaster validus*, but I knew that a second species, *O. meridionalis* was supposed to be there and I never saw it. I kept on looking, wondering if it was mixed in my samples because the descriptions of the two species are not very different. Now, of course we've got two other species of *Odontaster*.

PAUL: Those are the only two I know. Are there more?

JOHN: There's five species of *Odontaster* and the two new ones were described last year from molecular data. After they were picked up from molecular data, the folks who separated them saw spines that can be used to maybe tell them apart. They were found on the Antarctic Peninsula, but they could be found anywhere else. They haven't been looked for elsewhere, I don't know. I reviewed a paper recently, by the Brits, who now refuse to call the species they have been working with on the Peninsula *Odontaster validus*; they call it *O. spp*. I said to them, you guys are crazy, you have *validus*, those other species are found in deeper water. They're different colors, you can tell them apart. Slightly different colors, but, one of them is *pearsei* by the way, and the other one is *rosacea*, because it is rosy colored. I could have been screwed on that one, too, because I could have mixed up two species.

PAUL: I don't think you did, honestly.

JOHN: No, I didn't. *O. meridionalis* is a different color, and as you showed, it feeds on sponges and would not be attracted to traps. But, that's why I picked that species. It came into my traps, and then I did a lot of work in the lab. Well, we all did.

JACK: There was some spin off there that was interesting, that I had later decided that I wasn't really a plankton biologist and I was more interested in the sort of things John was doing. Not when I was down there but later on in my career. John was doing lipid analysis for starfish and I thought that was just great, the greatest thing. So I did lipid analysis on copepods, something that I had not intended to do at all. It was one of the most important things that I did down there.

JOHN: That was, yes.

JACK: It was only because we had a lab where we all worked together and I watched John do these things and then, that's kind of neat, you know, and so then I had the copepod *Euchaeta*, which you could see the fat globules in it, and so I started doing that, and that was what they call a serendipitous spin off event that one never plans.

JOHN: I also found that the main species of amphipod I was working on had a huge amount of lipid in it, *Orchomenella plebs* or whatever it's called now [Abyssorchomene plebs]. All these names are changing like [the white] sponges, but anyway, it didn't have a name when I was working on it.

LATER NOTE BY JOHN PEARSE: I checked my notes and see that the amphipods disappeared from the shallow stations in the spring, as soon as the sun came up. I should have remembered that because I did some experiments in the lab and found that they are strongly attracted to light. Also in the spring they turned green and they were full of diatoms (even those at Jack's deeper station). I figured that the light attracted them to the undersurface of the ice where they grazed on diatoms. I still think that is true.

JOHN: The amphipods disappeared from the shallow water, in the spring, as soon as the sun came up. It spooked me out. You couldn't get them. I could get it all year long from Jack's station so I got data on them for the whole year there. But not in shallow water, they disappeared.

PAUL: Shallow water was how deep?

JOHN: 20, 30 meters.

JACK: Do you think that was bottom ice?

PAUL: That's where your station was, probably it was over that, you said it drifted a little bit by the time it dropped the casing?

JOHN: Yes, anchor ice would be about that deep.

PAUL: He was over my wall [Dayton's Wall, a named underwater feature off Cape Armitage].

JOHN: Was it the winter or summer?

JACK: They disappeared from that station. I think they disappeared from John's station, too, which is about a hundred meters.

PAUL: Where was his station? In deeper water?

JOHN: We put up our two stations in the austral spring of 1960.

JACK: There's the stations we put in at that time.

JOHN: Then those stations went out in March or so. All of them went out. We had open water. We had a terrible couple of months when we could not go out on the ice.

JOHN: This is Dearborn's first station.

JACK: That's mine.

JOHN: No. Yes.

JACK: Yes.

PAUL: Just recording that they're looking at a map [on page four of Jack Littlepage's thesis] and pointing where their stations were.

JACK: That station was Mack Adams probably.

JOHN: When the ice went out this year, 1961, it went all the way out to Pram Point.

JACK: Yes, all of this stuff went out. All of that.

JOHN: Yes, but that was 1959.

JACK: See, that's actually the land.

JOHN: That's the land there. So that's the ice that broke out with John and I after we left Tressler's station in a blizzard.

PAUL: And that's Jack's station farther south there?

JACK: That's the Tressler station.

JOHN: That was a long way out. And that's where John Dearborn and I were when the ice all went out. Tressler had already gone. Did you use it?

JACK: I used it for a while.

JOHN: So that was 60A, your first hut, Jack.

JACK: That was a temporary one.

JOHN: And 60B. We don't have that on here.

JACK: That was mine.

JOHN: That's 61B. 60B was mine.

JACK: That's mine, yes.

PAUL: But it must have been here.

JACK: It was way up in here somewhere.

JOHN: It was almost right there. We put in the first two houses and then they went away when the ice broke out in the fall, and we had to wait for over a month, for the ice to freeze hard enough so that we could get back out there. And it was only about a meter thick, half a meter thick, it was very thin, very easy to work with. So we went out and put up three house. John's and mine and Jack's. We rotated around and helped each other.

JACK: We had a lot of cooperation.

JOHN: A lot of cooperation.

JACK: Another spin off that occurred and this is interesting, that I had to spend a lot of time, in my ice house just looking at the water, because the cables had to come up and down, and you spent a lot of time just sort of staring at the water. We had seals that would come up to breathe in the winter, and I realized that this was the only breathing place for probably kilometers around the place, by the behavior of the seal, how long they had been down, because if they had just went down for shallow dive, they came up and they were quite happy and they

wouldn't breathe very much, and play around and stuff. If they'd been down a long time, they came up and really clearly were out of breath. And so I started timing the things and that's when I came up with the first paper.

PAUL: Diving behavior of Weddell seal. Ecology 1963.

JACK: That got Jerry Kooyman into the seal research. It wasn't particularly correct but it did show that they stayed down a long time.

PAUL: What it showed me, too, was that you guys were thinking a lot and talking to each other constantly and really asking very good questions that hadn't ever been asked before. That's true for all three of your theses.

JOHN: What do you do when you're sitting out there looking in the hole.

JACK: Yes, bored.

PAUL: I mean, but there's lots of things you could do. You could drink, I mean, you guys were unusual.

JACK: We had no drinking problems in our group.

JOHN: No, we didn't.

JACK: We were too busy working.

JOHN: We had a couple of good flings .

JACK: Yeah.

PAUL: My point is that you're being modest, that you guys were unusually good scientists, and at a very early age, to see all that stuff, and ask those questions. The other thing you saw is I presume you saw it while you were looking down the water, the ice crystals drifting by, and in your thesis you recognized the supercooled water.

JOHN: You could see that

JACK: They were attached on the wire.

PAUL: That stuff really helped me [with my research]. But, that didn't happen just de novo. You were looking.

JACK: You could see them.

JOHN: And one of the nice things about cutting holes with the chain saw, you pick up rocks and little *Odontaster* frozen in the sea ice, and you're in over 30

meters of water. You could figure that out quickly that ice must be on the bottom that breaks loose to bring things up to freeze into the undersurface of the sea ice.

PAUL: You figured that out. This is the type of thing I'm saying.

JOHN: And Jack's also. He unfortunately wasn't there when I was out with two other people when a seal came up, absolutely out of breath, and could hardly breathe, and as we were watching it, a *Dissostichus mawsoni* came floating up. So I reached down and grabbed it, pulled it out as the seal was catching his breath and he saw it slide by, and you could almost see it say wait, that's my fish. That was the first *mawsoni* collected outside of the juvenile that was collected during Mawson's expedition and described.

JACK: We had tried fishing. We had big fish hooks. We never caught anything.

JOHN: You got flesh from the seals, we knew the fish were down there. We also knew that Scott's people had seen them. [They even collected one without a head that they found in a hole, but because it did not have a head they ate it rather than save it.]

PAUL: Did the fish, the *mawsoni* fish come up to the hole?

PAUL: The seal caught it, and let it go when it was trying to catch its breath.

JOHN: We realized also, that the fish that were found by Scott's group on the ice shelf had been brought up, about a thousand years ago, and people had all these ideas how the fish got there.

PAUL: Swithinbank and Curley rediscovered them in 1961.

JOHN: They had the idea that the ice was freezing all the way to the bottom.

PAUL: That was Debenham in Scott's team.

JOHN: They found fish there too. But how do you get fish on top of ice like that? Most of them didn't have a head. When they didn't have a head, the seals bit the head off so they could float to the surface and have their meal up there and then they could go back to it, but they would lose track.

JACK: When the seals came up, if they'd been diving a long time, they would, if I had the net in the [hole], they would go right through it. They were desperate.

PAUL: They were coming up.

JOHN: That's right. They were deep divers.

PAUL: It's interesting to recreate that sort of thing, because you're there, you're looking at something that people haven't seen before.

JOHN: One of the most illuminating things to me, and most, I don't know, spiritual, whatever, was spending all that time out there, in my station, waiting for the things to come up and looking down, and it was just a black hole. In October, when the sun came back and there was fresh new ice that had been frozen over the winter, it was just a windowpane and we could look down there, about 22 meters, and see the bottom.

JACK: I remember that when I first saw the bottom.

JOHN: Everything was dark down there, and then you could just lay down there and look at the bottom. You could see all these stars and it was just fantastic. You guys went diving down there, but that was the only time we had any idea what the bottom looked like.

PAUL: Before I dove under the ice there, I spent fifteen months looking down those holes.

JACK: I remember when you came back to the lab and said you could see the bottom. We all went out there and sat around and looked down, John was right, there's the bottom.

JOHN: You couldn't believe it. Of course, then it got darker and darker as the diatoms grew on the undersurface of the sea ice, and in another month, couldn't see anything.

PAUL: When you looked down could you tell what you were seeing? Did you know the anemones that you could see, did you know what they were? Or just white forms?

JOHN: I have drawings in my thesis about what we saw. We saw lots of stars and *Parborlasia*. They were very conspicuous.

PAUL: Because you would have got the nemerteans in your traps. One of my questions was about the group dynamics and apparently the three of you got along, really did.

JOHN: Everybody did.

JACK: Everybody got along.

JOHN: We had this fellow, Bill Fairchild, we called Cosmos, looking at cosmic rays. He was always easy to get along with. Tom Berg was terrific.

JACK: Sully was always good for entertainment.

PAUL: Did you all work out of the Bio Lab [Eklund Biological Center]?

JOHN: Yes.

JACK: Fairchild didn't.

JOHN: He had his own lab.

PAUL: That was the CosRay Lab building.

JACK: It was all electronics and you couldn't see anything.

PAUL: Same lab as when I was there.

JOHN: We used to go over to Scott Base and we got along very well with the Scott Base people too, they were very collaborative.

JACK: Rick [a mechanic or Karl Ricker?] was somewhat on the outside.

JOHN: Yes, he was.

JACK: At that time. One of the things was interesting, when we moved into the T-3, when we went down, they didn't have any bathroom facilities. We built a little urinal in the outer vestibule, coming in from the bio lab because we didn't want to walk way up there, and peeing on the street was frowned upon although it was done quite commonly. We made something that drained into a 55 gallon drum and we put everybody's name, it was a four liter plastic carboy, and everybody wrote their names on the inside of it. And idea was if somebody really pissed you off, you could get even with them. And only one name was totally eradicated by the end of the season and that was Karl Ricker, he got washed completely away.

PAUL: Well, Ricker is the son of a very famous fishery oceanographer and he was into mountain climbing or something and was trying to make a name for himself and was very sensitive about being the son of a famous person. So that may have been part of your problem.

JOHN: I don't think he was sensitive. He let you know his father was well known.

JACK: He was more pro-Canadians at that time, and he spent a lot of time at Scott Base.

JOHN: What was surprising to me when I looked him up recently, he made a big name for himself as a mountain climber and he's one of the big ones in British Columbia. I don't remember him ever trying to climb anything. You would have thought he would have taken on Erebus.

JACK: He used to walk to Scott Base.

PAUL: Did you guys climb Castle Rock?

JACK: No.

JOHN: Castle Rock, we went up to Castle Rock a lot.

PAUL: But did you climb it?

JOHN: I don't remember.

PAUL: Did you walk there or drive?

JOHN: We walked. We walked all over the place.

JACK: Yes. I can't remember climbing Castle Rock.

JOHN: I don't remember either, but I remember it was a place to go.

JACK: We had free rein and we would go off on a Sunday and grab a snowcat and just explore.

JOHN: We could drive up there, too.

PAUL: The changes with the military did happen, and in my mind, when you were there, those guys were volunteers and they wanted to come. The Navy guys.

JOHN: They were with us too.

PAUL: It was not true for me. Many enlisted men were very angry all the time.

JOHN: That they were there?

PAUL: Yes.

JOHN: No. No. All who were there were volunteers. Some of them thought they made a mistake. I don't know that anybody complained too much.

They complained at the end because I think one of the understandings was that they would spend a year in the Antarctic, and then they could go to their choice for their next duty station, and most of them wanted to go and be stationed near their home town as a recruiting officer or something like that. When the orders came through they were assigned to all sorts of places, including the Arctic so, for the next year, you'll be up on the floating iceberg on the Arctic. They didn't like that, and there were a lot of complaints and the commanding officer had to write back to headquarters and say, you're never going to get anybody to volunteer to come down here again.

PAUL: That's interesting, because that doesn't sound like I.G.Y. It sounded like to me, that the I.G.Y.era and Navy guys enjoyed the challenge of building the base.

JACK: We had no problems at all and when they were putting in the snow melter and things, we had some Seabees working, and there was one fellow who was so proud of what he had done, and he used a square and level and thought it was really high tech. He had never done this before, building like this, and they were quite proud of what they did.

JOHN: Yes.

JACK: If you needed some assistance, I can't ever remember them saying no, you can't do something.

JOHN: The one thing about it, is the enlisted people were all petty officers.

PAUL: First class, second class petty officers.

JOHN: That's right. So they were enlisted but they were not just recently enlisted, coming in. They had been in the Navy for a while and they had some status. When they got down there, they were the lowest ranking, so they were the ones who had to go and do some of the shit work, emptying the latrine barrels, and the like. They complained a little bit about that, but what was their choice, there was nobody else below them.

PAUL: You had the admiral spending the summer on the base?

JOHN: I don't remember that.

JACK: He came and went a few times. That was Tyree.

PAUL: Yes.

JOHN: That's right.

JACK: He would come in for a couple of weeks.

PAUL: He didn't have his own house?

JACK: Yes, flag quarters, just down from the USARP building but he didn't stay there long periods of time.

PAUL: Basically, they didn't hassle you at all, like they did us later, and they were supportive, and you go to meals and you go to the bar or something and people were happy.

JACK: Yes.

JACK: We could get anything we wanted. When we went out to the field stations, the mess hall would either pack you lunches and whatever you wanted or we had lots of pre-packaged things we could get to take out.

PAUL: The food has evolved a lot, too. Why don't you talk about what you ate and what they packed for you and if you went out for four or five days, or if you went to, you had a whole arsenal of food when you went to Cape Evans.

JOHN: We went to Cape Evans, that's the only place we spent a lot of time, and we flew a lot.

PAUL: For one day.

JACK: I did at Cape Evans.

JOHN: I know, the year before. I did stay overnight at least once with Jack.

JACK: And White Island --

PAUL: Did you have those little KRats? Canned combat food. I used to stay 12 hours shift in the ice house.

JOHN: We flew all over the dry valleys but we came back for dinner.

PAUL: When you went to the galley and asked, you were going to go to White Island, because you will need some food, did they make you sandwiches or what?

JOHN: No.

JACK: We had little boxes, some sort of a little field box is how I got most of my meals. They had some brown bread and some chili beans or something like that in them. There was some sort of military pack.

PAUL: Is that the K rations?

JACK: I had an oil heater in my ice house, I guess everybody did. So I took the top of it off.

JOHN: And we'd cook on it.

JACK: We could cook right on top of it so I would go get a steak.

PAUL: They just gave you steaks?

JACK: Yes. We had steak, lobster, anything you wanted, in the winter.

PAUL: Oh, that changed.

JACK: We would supplement it if we wanted, or we also had, remember the cocktail area, we used to have happy hour.

JOHN: That's right.

JACK: We'd take one corner of the lab and went to the stores and got some curtains, some sort of blueish curtains and we curtained it all off and we got some cable drums and made cocktail tables out of them. And then we had some access to the USARP con X? with booze in it. We used to make our own booze. It was quite an honor to invite others, some of the officers to come to cocktail hour, and we would go sometimes absolutely smashed to the mess hall. I can't remember if we did it every night or how often.

JOHN: No.

JACK: A couple of times a week, I think.

JOHN: I don't remember too much about that.

PAUL: Did the officers have their bar that year?

JACK: Yes.

JOHN: They had their own bar.

PAUL: It's the same one we had. It's still there. It's now a coffee house.

JOHN: I don't remember. They had a lounge, bar, with a pool table.

PAUL: Same one.

JACK: It was a Jamesway I think.

JOHN: Jamesway?

PAUL: Yes, So they --

JOHN: Officers had theirs, and chiefs had theirs, and enlisted men had theirs.

JACK: And we had ours.

JOHN: We had ours, but we were welcome anywhere, and we would go, depending on how you felt. Well, let's see, if I'm not too -- didn't mind laying back and being bored so I'd go to the officers' club.

PAUL: It's important, because I think it has to do with the volunteering, versus not volunteering to some extent.

JOHN: It might be. The people who I found the most stimulating, intellectually, were the enlisted men. They were curious and would ask us what we were doing and ask to go out with us. We'd take them out and they wanted to know what we were doing.

JACK: The officers in VX Six were also intellectually curious.

JOHN: They were a whole cut above the other officers, as far as just sharp guys. When they went flying, they wanted to know what they were looking at.

PAUL: Now I want to get into some of your boondoggles, because that speaks to the freedom to do them. What made you go to White Island?

JOHN: In the middle of the winter, we were reading Scott's stuff. I read that there were seals out there on White Island. I came to Jack and said, if there's seals out there, they can get out and that means we can get in. So as soon as we got light again we asked to be flown down there and look into the cracks and that's what we did.

PAUL: So you went and asked the pilots?

JACK: Essentially.

PAUL: Hey, guys, you know, we'd like to go to White Island, could you...

JOHN: Could you take us over there. That was an honor.

JACK: I remember that.

JOHN: They took us out there.

JACK: All our traps and everything.

JOHN: They flew away and there was the crack, with the water coming out of it. We started, opening it up, dropping gear through it, and we had stove pipe traps.

JACK: I remember those.

JOHN: We could shove them through the ice and then wait to see what's caught while we wandered around exploring, almost getting lost.

JACK: Did we blast a hole?

JOHN: I don't think so.

JACK: I think we just dropped the traps through the cracks.

PAUL: The cracks didn't go straight down though, it's thick, it's not like six feet thick.

JOHN: They were stove pipes, it's very thick.

PAUL: It's permanent shelf ice.

JOHN: That's where, was it Oliver, who was diving in there. Those guys went and camped there for a year, not Oliver.

PAUL: Kooyman's guys.

JOHN: And Mike Castellini, I think he took his wife.

PAUL: Somebody took a wife.

JOHN: And lived out at White Island and some of them were looking for seals and they went diving, through all that ice.

PAUL: I don't think so. I don't think they went diving.

JOHN: They went diving through that brash ice, I think it was Oliver who did that.

PAUL: It was my team. I had left, and we had worked out a way of dealing with brash ice. We put culverts down through it, and then shoveled the culvert out and so that was the way to get in and out.

JOHN: How thick was the ice?

PAUL: I don't know. The culverts were only about 50 or 60 feet deep. I mean, we bolted them together. They weren't that long, but the ice was way deeper.

JOHN: Still, it was unbelievable. You go down there and then you go down through kind of a wall of brash ice.

PAUL: I've got some photographs of it. What's really scary is that the brash ice went way lower than the culvert and it floats and it could have come right back up and plugged their exit. But this is in the '70s. You also went to Koettlitz Glacier.

JOHN: Yes, we saw open water there. I don't know how we figured that out.

PAUL: It was just a big crack and you fished there.

JOHN: According to our paper, we went back six or seven times. I just remember the one trip.

JACK: I remember going with the Otter the first time, because I talked to the pilot and I congratulated him on such a nice landing on this ice. It was the first time I ever landed on skis, it gave you lots of confidence.

JOHN: When we got down there, there was one other person with us and we can't agree on who it was, but anyway, the three of us, had a two-man tent.

JACK: You think it was John Bunt.

JOHN: I do.

JACK: It could have been because he was there, in the January-February of the last year we were there. So it could have been John.

JOHN: It could have been John because we were there in October, the first time.

JACK: Early. I remember John arrived and I took him out to our ice house and stuff like that. And scared both he and I to death by almost going into the ice.

JOHN: Well, I wish I could remember who it was. I remember there were three of us in there and the snow storm came up and we were stuck for a lot longer than we thought we were going to be. It was almost a day of being in that little tent and you open up and look out and it was totally white.

PAUL: Did you guys go all over the dry valleys. Was that with somebody or did you just go talk to a pilot and say --

JOHN: I think the pilots were more than glad to take us wherever we want to go. Where are you going today, can we go?

PAUL: Were you trying to do any science.

JOHN: No.

PAUL: Were you looking at the lakes?

JOHN: The lakes.

JACK: The glaciers. We heard rumors there was Don Juan Pond which was named after the two helicopter pilots who first spotted it; we heard there was water, and said, there can't be.

JOHN: They came back and said, we found open water up in the dry valleys and we all said, you're nuts, and they said, come on and see, and George Meyer went out right away. We went too and walked around.

JACK: Ken Armitage was there.

PAUL: How deep was the water? When I was there, it was thin, you could sort of walk across it. Was it a lake?

JOHN: No, it was very shallow.

PAUL: Six inches or something?

JOHN: Yes.

PAUL: Did you look for anything or do any science?

JOHN: Yes, we were looking for anything living. We had protists in it.

PAUL: At that time there were dry valley lake projects because Armitage was there.

JOHN: That's right.

PAUL: We knew that it was warm. They didn't understand why it was warm.

JOHN: No.

PAUL: There were people out there and so you knew there were cool vents to see.

JOHN: But Don Juan pond.

JACK: That was liquid on the surface.

JOHN: And it's not frozen below. It's not very deep.

JACK: And it's not warm. It's really ice cold.

JOHN: Really cold. It was liquid because it was so salty.

PAUL: And they actually found a new mineral there.

JOHN: Yes.

PAUL: That would account for it.

JOHN: I think the first paper was George's, wasn't it.

PAUL: Yes.

JOHN: George Meyer wrote a paper describing it.

PAUL: I'm interested that you guys, without any real excuse, to just say I want to go to a dry valley.

JOHN: They had to fly to keep their flying hours, and they didn't care.

JACK: They liked to fly, they really loved it.

JOHN: They had to fly. So they were asking can we take you somewhere, because we have to fly or they would just fly.

JACK: On the long trips, like to South Pole and Byrd Station, we just hopped on a trip that was going. We would just say, let us know when you're going to Byrd.

PAUL: Did you both go to the Pole and Byrd?

JACK: They would just say, do you want to go, we have a spot and we'd jump on and off we went. But on the local stuff, it was just a matter of asking.

JOHN: We'd have breakfast with the pilots, and ask where you going today? And get on. And for Cape Hallett, I think we must have asked for that. I know I wanted another sample of *Odontaster*.

JACK: We went together.

JOHN: That was the first flight up there. They knew the base was in trouble.

PAUL: Do you want to talk about Hallett? Hallett is an enigma that nobody wants to talk about.

JOHN: We flew in and it was a beautiful site, right in the middle of a penguin rookery.

PAUL: So you were there.

JOHN: We were only there for about three or four days.

JACK: I don't think it was that long.

JOHN: Well, it had to be long enough for me to trap my stars.

JACK: Well, it must have been a Jamesway we were in.

JOHN: It had to be long enough for me to cut a hole, put the traps down, get a sample and that would take a couple of days.

PAUL: You sampled stuff there?

JOHN: I took samples, yes. It was one of the more important samples. We put a trap in and then we just sort of had to sit there.

PAUL: The two of you, or did Dearborn go?

JOHN: No. Just Jack and I, and the flight was mainly to break the end of the season for those guys. So we sat around and talked to them.

PAUL: And that wasn't associated with the methanol poisoning there, was it? That was a different incident.

JOHN: I don't remember that. Was there a methanol poisoning?

JACK: I think that was when, after this group left and they sent some people up from McMurdo and they found a cache of methanol and they drank it. Local Seabees, I think.

PAUL: That place seemed to be cursed by history.

JOHN: I think Don Douglas was up there about that time. He was working on the penguins up there. There was a penguin researcher there.

PAUL: Rich Penny.

JOHN: I thought his last name was Douglas.

PAUL: Okay, I don't know. Anyway, I was interested in that base

JACK: I don't remember much about Hallett.

JOHN: It was a gorgeous place and the people there, it was quite a thing to see, people who were wintering over and not getting along with each other.

PAUL: That's the history... every year.

JOHN: Is that right?

PAUL: Yes. You know, it was Kiwi-American issues, armed camps sometimes.

JOHN: There was a Kiwi base there, too?

PAUL: It was split.

JACK: Shared.

PAUL: Well, there was the U.S. and Kiwi shared the base and they shared the personnel.

JOHN: And they were all military people?

PAUL: I don't know, but they sure didn't get along. Year after year. So do you remember the commanding officer's name there when you wintered?

JACK: No. He was very good. We got along very good.

JOHN: Everybody got along with him. He wasn't very intrusive as far as I remember. VX six officers very good.

JOHN: The officers, they might have been boring but they were easy to get along with. They were very accommodating.

JACK: One thing we haven't talked about is the role of George Meyer. And he was very good as party leader. He enjoyed working with the officers, he spent a lot of time with them, and I think it was due to a lot of his work that we had no problems, because we worked mostly through George if we wanted something special.

JOHN: He was very good that way, and he acted very much as kind of an uncle for us and would give us these things and sometimes when he thought we were not doing the right thing he would gently let us know. We also had the sitreps (situation reports) to write every month. We had to do that and I remember George always being very disapproving of me, because I wrote those as a record of what I was doing and they were quite detailed with data. I was also hoping that Giese would read them too, so he would know what I was doing. I wrote him lots of letters of what I was doing and everything too. But George was just very concerned. He said, you don't ever put any data in your sitreps. Why, he said, you'll come out of the Antarctic and find everything you did is already published. I said, who would take such data? He said, you don't know how unethical scientists are, they'll take your stuff. I said they haven't been here, how could they write it up. I never paid attention to him, partly because it irritated him so much.

PAUL: Interesting. You had a big fire one year.

JACK: Yes, February. The paraloft burned down.

PAUL: That put the fear of God into the rest of us for years.

JACK: It did us.

JOHN: Yeah.

JACK: I was figuring out when we started the fire watch. We independently had a fire watch, started about that time, and probably as a result of that.

PAUL: Yes.

JACK: There was always somebody responsible to walk around in the middle of the night.

PAUL: That's right. We did that, too, and we took turns doing that. Civilian and Navy. We did our own.

JACK: Yes, we did our own.

PAUL: And there were a lot of cases in the PreWay heaters --

JOHN: Yes, it would be disastrous in the middle of the winter.

JACK: We were, of course, afraid of losing all our data. We were so afraid of fire. So there was always somebody, we shared weekly one night a week or so, we had fire watch duty.

PAUL: That was because of concerns about the heaters?

JACK: Just fire in general.

PAUL: How did your fire start? It started with the preway?

JACK: I don't know how that started. I just remember this huge fire, right down below the lab.

JOHN: That's right.

PAUL: Because of the wind and the dryness,

JOHN: The whole place could go.

PAUL: So did you have any other crises like that? How about fatal plane accidents or people falling through the ice and dying?

JOHN: No. We should have but didn't.

JACK: Everybody was very lucky. Our biggest danger which we didn't even realize at the time was carbon monoxide because John and I worked in very small huts with the gasoline engine running, no detectors, no nothing, we were locked up there all alone and it ran for 12 hours, 14 hours, sometimes, while I was doing my station work, with no ventilation. Why we weren't killed is just beyond reason.

PAUL: Did either of you have any scares or anything bad

JOHN: No.

JACK: Scares, I had one with John Bunt. We had the pole cat, and I was taking John out. He had just arrived. The ice house used to accumulate snow and it was sort of routine that I would drive around and get the snow moved away, because the ice was like a rubber sheet. In the hut we used boxes for shelves, and you would always make your shelf level, relative to the ice, when you were in the hut. Then the ice would change so when you went back into the ice house on the next visit, there were shelves going this way and that way, because the house would sink and tilt from all the snow. So we tried to keep the ice clear of snow. On the first trip out with John I took a run around the ice house and I guess it had been a warm period or something. The ice had melted and we ran across just behind the ice house and the pole cat dropped about four feet. I'm glad it was the pole cat because I just stomped on it and we went down and the trailer came down and we went up the other side.

PAUL: I've done that with that same pole cat several times.

JACK: That was the last time we drove around the ice house.

PAUL: My adventures were in the transition zone usually.

JOHN: Yes, transition zones.

JACK: You just wondered how thick is the ice below us. Let's get out in a hurry.

PAUL: Did the Navy have anybody go through the ice in the cats?

JOHN: Somebody went through the ice in Winter Quarter's Bay before us, a year or two before us. A tractor went down.

JACK: Tractor went down, they tied the ship to the tractor, and the wind came up and drove the tractors in. That was when they were establishing Hallett or bringing tractors back from Hallett. They had a problem. That's when they used to drive them with the ropes, going across the sea ice from Hallett. We didn't lose anybody. Bird was several years later.

JOHN: You lost Jeff Rude, Paul.

PAUL: Yes, but that was later. People died when I wintered over.

JOHN: Somebody died when you wintered over?

PAUL: One guy walked into a propeller. There were two fatal plane crashes, not at McMurdo but outside. I knew the people in every case.

JACK: Were you there when Tom Berg died.

PAUL: No, I had just left. I knew all about it. Like you, we got into that. But, you know, at the time death was sort of with me, and they made me sign a release, maybe you didn't. The release was that your body doesn't have to come back, it's a war zone sort of thing, we'll just bury you on site.

JOHN: I don't remember signing anything like that

JACK: I don't remember that either.

PAUL: I said I'd be happy to go down in the ice. So you had this on your mind, and a guy fell and broke his neck, and should have died but stayed alive in the middle of the winter. It was mid-winter night, the party, and he was in the fire department, and he was the chief, and so people didn't tell him what to do. He was upstairs, and took a run at his pole to show somebody and he missed the pole by about five feet, hit head first, and so, they actually had a mid-winter evac [evacuation] for him and it was a huge deal. So I had a lot of excitement that you guys didn't have.

JACK: We had a couple of helicopter fires where men were jumping out of helicopters on fire.

JOHN: I don't remember anything like that

JACK: We were on the ground for the most part when we had the fire. We were just told to get out and we did very rapidly.

PAUL: That's how I learned that you always wore gloves because the magnesium would be burning so, I guess it was from your fires, that when I fly on a helicopter, I wear gloves

JACK: I remember, the fire was right at the helo pad one time, and another time I remember flying back and we, with Tom Berg and being a geologist, he collected tons of rocks and they didn't know. He put these packages in and the helicopter got heavier and heavier. And Buddy [Krebs] was a wonderful pilot and he would take us anywhere.

JOHN: Yes, he was terrific.

JACK: We'd get started and go about a quarter mile or something and stop. I asked Buddy, are you having problems flying? No problem taking off, just staying up is a bit of difficulty. We hopped and skipped all the way back to McMurdo. We'd get up for a mile and land and get the rotor going again and take off again.

JOHN: You got back and those rocks were in there?

JACK: There were rocks and Tom Berg got shit for going up with rocks.

PAUL: When you had your fires, did the helo catch on fire?

JACK: Yes.

PAUL: ... and it burned up. It's magnesium, you don't put that out.

JACK: The engine compartment, they had the big engines in the front and that was where the fire was, and it didn't burn the whole chopper up. It was enough smoke and fire and stuff, that we got out quickly.

JOHN: Fast.

PAUL: Can you think of other exciting things?

JOHN: Tom didn't get out fast enough.

PAUL: He went back in.

JOHN: He went back in, that's right.

PAUL: He went back in to get his camera and the Kiwi went back in with him. Jim Brandau got the plane down, and it was on that cone in Upper Taylor Valley, and it's a steep cone. He had brought it down, and it bounced and rolled and then the dust settled. They all got out, and the plane was sitting there and they thought it might roll down more, but those two guys went running in and got into the plane to get their cameras, and when they got in, it rolled it down and it caught on fire. Were you there when Fio Ugolini had a helo crash in Wright Valley?

JOHN: I don't think so.

PAUL: That would have been in 1961, maybe that was after you left maybe.

JOHN: We were there all of 1961.

PAUL: Well, it's an interesting story.

JACK: I don't remember it.

JOHN: I don't either.

JACK: I remember it was kind of scary flying there because the chopper pilots depended on up-lift of air close to the cliffs and so we would go along, looking like we're going into the cliff and then up you'd go and then across. It's a scary place to fly.

PAUL: It still is. His thing was different as he was in his tent in the valley.

JACK: The plane, was it an Otter?

PAUL: No, it was a helo. They thought it was funny, because he was Italian, and there by himself, and so they always dusted him, tried to blow his tent away. So the guys were doing that, they had the helo on the side and Theo was inside his tent, holding things down and cursing, I'm sure. And then the helo hit the ground, and went into auto-gyration, and it shook itself apart, and the tail rotor went right through Fio's tent, and the dust settled and the guys were hurt, and Fio came out and saw it, had dealt with all this mess and got on the radio, and tried to get help. He had one of those radios that never worked, and forgot to let his finger off the send button, and forgot English so he's just screaming away in Italian with his finger clamped down. Nobody heard him at McMurdo, but they heard him at Pole, so somebody got on another channel and got somebody to go out and rescue the pilots.

JACK: That did occur when I was there, when you described the autogyration and the transmission. I remember that part, but I didn't know people had been injured, but I do remember now that there was an accident there where a chopper self-destructed on the ground.

PAUL: Yes. I have a picture of it. I went out and saw it.

JOHN: I don't remember that at all.

JACK: I definitely remember it, but not the people.

JOHN: I remember Fio.

PAUL: I'm interested in the management of science and George Llanos's role and how you perceived Llano and Curly, because Curly had two operations as I understand it. One, he was running the Bio Lab, which was separate from his fish program, and you guys were separate from his fish program.

JOHN: Right.

PAUL: So you weren't doing his respiration like I was.

JACK: No.

JOHN: No.

JACK: One question you asked, did Curly interfere with us or demand anything, absolutely none.

JOHN: Curly was wonderful. He just wanted to get us down there to validate having people down there doing science.

JACK: If we needed anything, he would get that as best he could.

PAUL: How about George Llano?

JOHN: George was one of these figure heads who kept us under his wing, watched out after us.

JACK: We didn't deal with him. Curly did most of that. We saw George more after they built the USARP chalet.

PAUL: Who were the NSF people you guys dealt with?

JOHN: George, Tony.

JACK: He was there on the ice.

JOHN: In the summer, nobody from NSF stayed over the winter.

PAUL: No.

JOHN: But George, he was terrific.

JACK: He was there all summers.

JOHN: Both summers.

JACK: He could have been. He was very good.

JOHN: There are a bunch of pictures here [in an Operation Deep Freeze year book], which are all familiar, of people who were there. The information officer, what's his name, Lytel, the publicity officer.

JACK: He was there.

JOHN: And he was really good.

JACK: There was nobody there that was really a pain.

JOHN: No.

JACK: We got in arguments with them sometime.

JOHN: Nothing like when I went back in the 1980s. Ken Moulton. George Tony. Bert Crary was there.

JACK: Transport. Traverses.

JOHN: And the director, Tom Jones came down a little bit. Remember him?

PAUL: Did you guys interact with Tom Jones, F.J. Thomas?

JACK: I did.

JOHN: No.

JACK: I interacted with Thomas. Because I wrote my thesis back at Victoria, at the shack, and that's where Tommy was. But Tommy, I don't think he was hired when we were down at McMurdo, I think he was hired after we got back but I did have a lot of interaction with Tommy. He did a good job running the program. But did he ever go down? I think he went down once.

JOHN: He could have, I don't know.

JACK: I don't remember if he went down.

PAUL: In 1963, I was just a peon for Curly, and I didn't have my own program until 1967. I wrote the proposal in 1965-1966, and everything I did, I had Llano helping me. I didn't have Curly helping me. Llano just made my career possible. I think that's true for a lot of people.

JOHN: Curly brought down Bruce Wing, and they gave me Bruce to help at Cape Evans. I went there my second summer with Bruce. I went out with a raft and dip net. I also had chest waders that I could go up to about here, and waders came up to here. Among other things he held the rope tied to me so I wouldn't float out to sea. Bruce was really helpful. Jerry Kooyman and Art DeVries came down that second summer too, working with Curly.

PAUL: That may have been the first year that Curly did the fish program. When was he doing his own research there?

JOHN: He was doing it that year, summer of 1961-1962. I don't know about the year before.

JACK: No, because he had that metabolism chamber, and that was installed the second summer.

JOHN: Second summer, correct.

PAUL: 1961.

JOHN: Yes, 1961-1962.

JACK: He didn't go down with Dearborn.

JOHN: He wasn't down there then.

JOHN: I don't know when he went to McMurdo the first time.

JACK: 1961 may have been his first year.

JOHN: Ken Armitage went down that summer too. I don't know how he arranged that, but he was on his own. He wasn't part of Curly's group.

PAUL: No, he wasn't.

JOHN: Larry Harris went down. He was an undergraduate sent down from Berkeley. I cannot remember who he was working with.

PAUL: He was working with Ellsworth Dougherty.

PAUL: Dougherty committed suicide so he didn't leave much of a legacy.

JOHN: I knew that, but I don't know what he had Larry doing down there.

PAUL: Rotifers or something.

JOHN: Dougherty was a micrometazoan fellow. He was pretty eccentric.

JACK: They worked up at Cape Evans quite a bit.

JOHN: Up at the ponds up there, and they had a lot of trouble because none of them thawed, so Armitage and Harris were up there looking for freshwater things, and it was all frozen. Armitage picked up on *Orchomenella* that we were collecting in our traps. He asked if anybody knew what they did in respiration and, and when we said no, he became the first study their respiration. I was very impressed how he could pick up on that so quickly, rather than sit around waiting for the ponds to thaw.

PAUL: Armitage went down to work in the dry valleys.

JOHN: He did, but it was all frozen, so he couldn't do anything out there.

PAUL: He's the one who discovered that it was warm at the bottom.

JOHN: He did do that too, yes.

PAUL: So he did do some things. He sampled water.

JOHN: That was probably also secondary. He was looking for lakes that had thawed, ponds, and they weren't thawing.

JACK: I think the primary lake was the one at Cape Royds or Evans.

PAUL: Royds has one.

JOHN: It was all frozen. So that may be why he went to the Dry Valleys and did the coring. He was another one, a young man, he wasn't going to sit around and wait for the things to thaw. He was looking for things to do.

JACK: Some of the summer support were not that way.

JOHN: That's right.

JACK: Some of them just came down and sat.

PAUL: Armitage was a student.

JOHN: No. He was a young assistant professor, I think.

PAUL: As a limnologist.

JOHN: Right, which is not what he does now.

PAUL: I'm trying to get a catalog of some of the early scientists that were there as really young people, because it's impressive. Curly had a really good eye for getting good students. There were other good students down there. Larry was a good student.

JOHN: Larry was.

PAUL: Ken Armitage obviously was. Can you think of others that impressed you?

JACK: Charlie Goldman was down. He brought two students down with him. I can't remember their names, one later became involved in University of Washington or one of the small universities out of Seattle. One of them was openly gay, and became more so. He was well liked by everybody because he would take part in theatrical things and he was a very creative person. He was involved in all of the base activities.

PAUL: That was just summer or winter?

JACK: Just the summer.

PAUL: It was Charlie Goldman's student?

JACK: Yes.

JOHN: It was 1961-1962.

PAUL: The Navy and everybody were open minded?

JACK: Well, he didn't advertise he was gay but he clearly was, as probably George was. I know George hated women. You knew that.

JOHN: But you didn't know if he was gay or just asexual.

PAUL: Speaking of women, about getting women to come to the Antarctic and work and be colleagues

JOHN: I spent a lot of time with the officers talking about that, and they always said, they couldn't do it. The Navy didn't have any place for women, they'd

be too disruptive, besides that, we'd have to make a separate latrine for them. I'd say you guys are Seabees, you can do that. That's not hard to do.

PAUL: They just couldn't talk about it, because it was a big topic for me too, in the group. You guys talked about it and things, so from the very beginning, essentially, the civilians wanted equality.

JOHN: It wasn't to have women down there to screw, I just thought it was stupid not to have women down there, there are good women scientists.

PAUL: I wanted both.

JOHN: Then they also said, we couldn't talk like Navy people, swearing and all. When I went down there again in 1984, my first time back, it was really a revelation to me, because I got on the C-130 at Christchurch to fly down, and after we were all strapped in, a little woman comes up on the flight deck and says, I'm Lieutenant Pauline and I'm going to fly you guys down today, and I was like what?! I realized things had changed, but people were swearing like they always did, and there were women all over the place. It didn't change the behavior at all. Men fought, however, in the bars. That's what changed, in the 1980s. We never fought in the 1960s. We would go into bars and things and even with the enlisted men, we didn't have fights, but men were aggressive with each other when women were there.

PAUL: The thing I got in the wardroom when I brought this up, not only do we have to build a separate latrine, but our drunken enlisted men will rape them. And we can't control that.... I just remember getting in their face, what do you mean you can't control them? You are the captain! But, I think the NSF, I think they were looking forward to having women in the early 1960s, or 1964 when they started building 225, one of the dorms, that had separate showers and toilets at each end. I thought it was clear that they were setting it up to have women, that the NSF was trying to deal with that issue. We were sleeping in it in 1967, and I think it had been built in 1964 or '1965. I think the NSF may have thought about including women, to their credit.

JOHN: There were a couple of women who were really outspoken about going down there. One was Mary Alice McWhinnie (from DePaul University). She was one of the first women scientists working in the Antarctic. She first went on the ships.

PAUL: She brought nuns with her as assistants [including Sister Mary Odile Cahoon]. She came down to McMurdo early in a winter flight with three assistant nuns, which had a big impact. There was a female geologist, a team of geologists

that came in, too, and they hustled them right out the valley, but John Oliver's wife was the first one to really be a part of the whole year. I had to threaten George Llano, because George was in favor of it, but then they overruled him and said we can't have this couple down there. I was talking to George, and then I wrote him a letter, saying there are strict rules at Scripps. You guys are going to get sued. I don't want to threaten you, but we will force this issue. In fact, it was a threat. Apparently it worked because then she went down and everybody was sweet and nice and it was spectacular.

JACK: But she clearly had improved facilities than we had in 1960, 1961, because we had one shower, at the far end of the base. Two or three stalls.

PAUL: That's what we had too.

JACK: And there was no way that you could easily convert it to a two-sex system.

PAUL: I'm sure you got the same things that I got because I lived in the same place and showered in the same place, when I showered.

JACK: Right. Tried to do it once a week, whether we needed it or not.

JOHN: That was about it. Yes, and you didn't need it.

JACK: It was cold.

JOHN: And Carl Hamner, he was down there. He had some idea that being close to the South Pole would disrupt rhythms.

JACK: He did biorhythms and Hoshisaki was with him, too.

JOHN: That's right, and he was doing rhythms in plants and hamsters.

PAUL: Why don't you talk the Russian observers. Every year, there was a visiting Russian because of the IGY.

JOHN: We had Sven.

JACK: Those were tourists. Essentially, they didn't do any research there. They came by to re-fuel.

PAUL: Maybe after you, there were people there that were scientists.

JOHN: We had a Russian. I don't remember very much about him anymore.

JACK: Was he working on cosmic rays with Cosmo?

JOHN: That's probably true.

PAUL: We had people and it was keeping an eye on each other, not military, but part of the treaty that was carefully honored, by the Soviets and the Americans.

JACK: He didn't winter.

PAUL: Ours didn't winter either.

JACK: But he was there for quite a while.

JOHN: He was there and a nice guy but I don't remember very much about him.

PAUL: You did interact with him then?

JACK: Oh, yeah.

JOHN: Yes, we'd eat with him.

JACK: We had weekly summer seminars quite often, and everybody would talk about what they're doing and if tourists came through, they would give a seminar to us, and on a fairly regular basis, so we got to know most of the projects, and that's when I really began to appreciate the value of having a lab where you have multi-scientific endeavors going on. You knew what the geologists and physicists were doing, that was an enlightening experience. That was through the seminars that we had. But I think he might have been with Cosmo, because he definitely was not in the Bio Lab.

PAUL: There was one guy that really got into sea ice physics and worked with Art [DeVries] over years measuring ablation, and so some of the Russian scientists were serious scientists.

JACK: Well, I don't know. I assume Sven was a serious scientist.

JOHN: I think he was serious scientist.

JACK: He certainly didn't appear to be KGB down there.

PAUL: Well, when you had your visitors that you just said, there was, in 1963, an inspection which was a big deal. The Americans decided to make sure that the treaty worked and that we had a team of inspectors that went to the Russian bases and they worked out of McMurdo and we entertained. They were biologists. And the whale guy, Vic Shepherd, was on that, for example. Art and I hauled him all over the place. The Russians reciprocated with two plane loads of visitors that came for about a week, and they came in the funny airplanes. They had all these

wonderful fur hats and things, and they were just so excited to be there. It was this great Cold War tension, and here were these cool guys. They would give away a bear-skin hat for a second class Seabee hat, and thought they got a really good deal.

PAUL: All the Navy guys were wearing these big hats around, and there were some interesting things too. They didn't want to fly on our helicopters, and the pilots didn't want to leave their planes, and they had to come in and eat. So there was a great deal about wanting to drive them out. Sometimes we drove them out in the pole cat, but the Navy took umbrage and made them fly, and they had the tail rotor come off as they were landing, and it was a very hard landing. Everything was okay and the guys got out white as a sheet. They got into their Ellyushin or whatever their plane was and never came out again, but it was good spirit.

JOHN: Yes.

PAUL: Right in the middle of the Cold War.

JACK: Well, ours were, as near as I know, just tourists, they were just on the way to Mirnyy [Russian Base].

JOHN: Re-fueled.

JACK: I know it was the first time the Russians had ever been there.

JOHN: It was, so it was a big deal. Visiting Russians

JACK: They had something like a C-130 and something more like a 707. Very nice aircraft, beautiful aircraft. They were certainly free with tours of the air plane and everything. I can't remember how long they stayed, about three days.

JOHN: It wasn't very long, but they turned the base upside down. They were all over the place the first day or two, and then they were kind of subdued.

JACK: Hung over.

JOHN: Badly hung over. The Seabees saw that and of course tried to get them to drink more, and no, no.

JACK: It was a good visit and as near as we could tell, there was no ulterior motive there, they just came through to get some fuel and have a good time.

PAUL: That's really what ours was, too, but it was done in your face, because the Americans had...

JOHN: Had done it before.

PAUL: When the officer arrived, did the Japanese come when you were there?

JACK: No.

JOHN: Oh no.

JACK: That was the only international visit, I think, was the Russians, as I remember.

JOHN: Here it is. Sven [looking in the Deep Freeze yearbook].

JACK: He was a glaciologist.

PAUL: For me, being a political animal, I suffered a lot in my year without getting information. You guys sound like you had ham radios that worked, and I didn't.

JOHN: We could call out. It was a small ham shack.

JACK: Near the mess hall.

PAUL: Call this person and they patched you through.

JACK: Oakland.

JOHN: He was very accommodating and he was doing it as a volunteer. Everybody could hear everybody's conversation, so you'd be sitting there waiting for your turn, listening to some Seabee talking to his wife and asking about how is the car, how is the dog and the kids. Nothing about how are you?

PAUL: So, did you feel isolated then? You must not have felt as isolated as I felt.

JOHN: You knew the winter was going to be over.

PAUL: But you weren't worrying about Cold War things?

JOHN: No, that political stuff was not there at all, except I remember talking, particularly to some of the officers who were kind of anxious to get into Vietnam and get that over with. They were so confident that all we had to do was just put U.S. military might in there, and it would be done, in a week, you know. I was kind of horrified, but this was 1960.

JACK: 1961.

JOHN: The Cold War was on, but it wasn't like there was anti-war.

JACK: No, it wasn't. That must have been the time when the Russians put their first astronaut on. I remember in the mess hall they made an announcement from President Kennedy, announcing there had been this spectacular advance in space.

PAUL: [Yuri] Gagarin's flight around the world.

JACK: Yes.

PAUL: You were there for the Bay of Pigs, the invasion of Cuba?

JACK: I don't remember.

JOHN: I know about the Bay of Pigs, of course, but I don't remember us feeling one way or another about it. Bay of Pigs was before that, wasn't it?

PAUL: Maybe it was.

JACK: We were home for the Cuban Missile Crisis I remember that. We were back at Stanford by then; I was already in Stanford for Bay of Pigs.

JOHN: That's right.

[Bay of Pigs was April 1961. Cuban Missile Crisis was October 1962.]

JACK: I think primarily, all of us were worried about our research and if we needed things, this is how we got things to us on the first plane in. I know my wife bought a tape recorder, that was her anniversary, instead of wedding, engagement ring, we bought an Ampex tape recorder and, because we couldn't afford both, so we hooked it up to telephone and she would record all of the phone patches. Then, quite often you couldn't understand a thing, but she would record everything and then go back over it, and figure out what we wanted. So when the first plane came in, we had everything we wanted, including Curly sent down "phocacidal pellets." We weren't allowed to have firearms but we had a pistol that we used to shoot seals. I didn't have any shells left and so I asked on ham radio for them to send some down, so it was "phocacidal pellets."

PAUL: Other programs ... Sladen would have been there, were there penguin researchers?

JOHN: There was a picture of Don Douglas [in Deep Freeze yearbook], and he was up at Hallett.

PAUL: So nothing was going on at [Cape] Crozier when you were there?

JACK: Before yours, I think there was some Crozier work going on, because I was at Crozier, and so it must have been the first year.

PAUL: That all developed after, between us.

JOHN: Yes.

PAUL: How about Lynn Gressitt?

JACK: He was there.

JOHN: With Keith Woods, and ...

JACK: And Robin Leech.

PAUL: So you had an insect program. Did you interact with those guys?

JACK: They were at the lab all the time. They had Otters fixed up with big aerial plankton nets. I never went on a flight with them or anything.

JOHN: No.

PAUL: They would have been just summer though?

JACK: Just summer.

JOHN: Yes.

PAUL: Let's talk a bit about John Bunt?

JOHN: Well, I don't know when he came out.

JACK: He had to come down at the end, the first early flights at the end of 1961.

JOHN: That's what I thought.

JACK: He was in the pole cat with me going around the ice house.

JOHN: So that would be early on. John Bunt was sort of a pioneer. He was the one who spent the year up in Mawson. I spent a lot of time talking about what he found there. I had found that *Odontaster* had larvae, and it was thought at the time that in the Antarctic, nobody had larvae, so I made the mistake of thinking they were benthic. They had larvae but they're not in the plankton. Jack never found them. John never found them in his plankton work at Mawson, so I assumed they had to be benthic larvae and that's what I published.

PAUL: It appears Bunt did do some early diving.

JOHN: He did, at Mawson.

JACK: He didn't dive at McMurdo. He worked on phytoplankton, probably did some C-14 work, which would have been the first of the C-14 done at McMurdo.

PETER: Bunt says he did, using Vern Peckham's suit. It's documented in my Antarctic ice diving history.

JOHN: He might have.

PAUL: He might not have done as much science. You were before Vern Peckham's diving.

JACK: We were there.

JOHN: We had no idea he was diving, at least I didn't.

JACK: No.

JOHN: That was something, because that's one thing the Navy was against, was diving. There was never any question about it.

JACK: So they would have kept it very quiet.

JOHN: When I found out Vern had been diving there, I was really irritated because I wanted to have somebody tell me what we saw through the hole, what it was like.

JACK: I spent a lot of time with John Bunt. We went to Paris together and I spent a lot of time in bars and stuff with John, and he never mentioned any diving in McMurdo at all. He talked only about his official work.

PAUL: He used to talk to me about it, because when I went down to dive, he had some divers down there, a guy named Lee and somebody else. They were there before I got there, and they were diving, and Bunt told me at the orientation meeting about his diving. I think he dove on the other side of the sound, maybe getting out sight

JOHN: Was he in my hole?

PETER: Vern was just off in your area.

PAUL: That's what gave me an idea of where your hole was. We should talk about the diving because Peter has this whole interesting history. Vern, I'm sure, did it through your hole but that would have been toward the base from where your pipe fell through, your casing fell through by about a hundred yards, because Vern went down and put circular rings around and they were all over, the top part of the wall, the cliff there and then they were along the bottom, about 130 feet maybe. He must have had 20 of them. I took pictures of them very carefully and sent him the pictures, and he was going to look for succession.

JOHN: Right.

PAUL: And that was all around where the cliff is, and, then your casing is now a hundred yards farther away.

JOHN: If I remember from his paper, he did the first dives when we were there, but then didn't do anything more until much later. So he wasn't diving most of the time we were there.

JACK: No. I can't honestly remember him ever diving.

JOHN: No, I didn't either.

JACK: We would have known the hoops.

PAUL: It's interesting that he'd hide the tanks and compressor.

JOHN: What really got to me was to find out Curly was behind it all. He was able to smuggle all that stuff down.

PETER: I don't think they had a compressor. From what I was told, Richard Harden said they were filling scuba tanks from larger tanks. The compressor was on the base, but they were filling scuba tanks from other tanks.

JACK: I never knew there was a compressor on the base.

PAUL: The fire department had one. There were compressors around, but still, hiding it.

JOHN: How did you get into diving there?

PAUL: How did I?

JOHN: You went down there the first year.

PAUL: Curly said, oh, absolutely not.

JOHN: He told us that, too.

PAUL: We can't have any diving, that's forbidden.

JOHN: He told me that, too. Then I found out about Vern and I thought, what the hell is going on here.

PAUL: Exactly, isn't that interesting, and Vern made 37 dives, one was to 154 feet.

JACK: That was just not on the scope at all. It was just one of the things that was not going to happen.

JOHN: So then you went back and proposed to go down and dive?

PAUL: Yes, but then there were divers in 1964, and 1963. Jerry Kooyman had a suit and was recreational diving for photos as well as watching seals diving and that's when Carlton Ray came, and Jacques Zaneveld. Zaneveld had a program with one diver who would go out with a line on him. Nobody made more than a handful of dives, maybe seven or something, but they were diving, and the Navy wasn't stopping them. Curly was there and Kooyman and us too, and no, you can't do it. Navy won't allow it, and I'm pulling Jerry's stuff up. Curly himself had hidden Vern while he was doing it.

JOHN: Wish we had gotten a hold of Vern earlier, or Curly for that matter. I don't know what he was thinking.

PAUL: I wonder if anybody ever did talk to Curly.

JACK: I don't think so.

PAUL: I mean, that's the problem. You guys, when I came in 1963, you guys were writing your theses, and I think you were hiding from Curly pretty effectively. You weren't ever around the net loft, and Dearborn was, and Curly would stoke up his pipe and start a story, and Dearborn's eyes would just glaze over, and he'd just lean against the wall, and ooze around the corner.

JOHN: Yes.

PAUL: So that's why nobody interviewed Curly.

JACK: Were you on the dog trip with Dearborn, out to the glacier, I think it was one of the ice breakers? We took the dog team out.

JOHN: That must have been your first year.

JACK: First year, and that's when they had all the dogs.

JOHN: The dogs were gone when I was there. The dogs were only at the New Zealand base.

PAUL: So the dogs were there, between you and --

JACK: 1959, 1960.

PAUL: The Navy had dogs?

JACK: The Navy had dogs. It must have been John and I, only time down there that I ever listened to a padre, and he came with some wild idea that we would take a dog team up to this Glacier ice breaker, which were four or five miles up the sound. If we took them up, they would send a chopper up and pick us up and the dogs and everything and bring us back down. We said, okay, we can do that. We envisioned, like you see in the movies, we're riding on this sled, and it's going to be great fun. Well, it's not the way it works. You run behind the dogs or in front of the dogs, trying to get them to run.

JOHN: That's right.

JACK: Then of course, he hadn't asked the VX Six to pick up the dogs and the pilot said, no way a dog is going in my helicopter. Then it got stormy and we couldn't fly anyway, and we had to take the dogs back to McMurdo through the blizzard. We were out 16, 18 hours with these stupid dogs, and was it a memorable trip. When we got there, they allowed the people on the Glacier off to go on the ice, and when they're off the ship, they can have beer. That was the only thing they were interested in, drinking beer, and the fact that we were there with this dog sled made absolutely no impression on them at all.

PETER: Were you aware, after you started publishing, that there a burst of interest in Antarctic research? Were people contacting you or talking to you at conferences, or was it just another article published?

JACK: John can speak to that better than I could.

JOHN: Probably not, I went off to Egypt, I never got much feedback.

JACK: I went off to Canada.

PETER: It wasn't like it was a huge deal?

JOHN: No. Not at all.

JACK: No. There was a meeting in Paris, Antarctic convention meeting or something.

PAUL: It was the first SCAR [Scientific Committee on Antarctic Research] meeting.

JACK: That was pretty impressive because there had never been to anything like that.

JOHN: I didn't go to anything like that.

JACK: I remember that we were guests of the French government and we had first class accommodations, and all the pomp and circumstance to go with it. We went into the palace, and there were guards around all dressed up.

JOHN: Did John Dearborn go?

JACK: No, just John Bunt and I.

JOHN: John Dearborn did keep in the circle with the Antarctic group. I didn't at all.

JACK: He got more into shipboard work.

JOHN: Shipboard stuff, that's right.

JACK: And did he ever go back to the ice?

JOHN: I don't think so.

JACK: I don't think so.

JACK: Shipboard from then on.

JOHN: Right.

PAUL: Did you give a talk on your thesis? That was before your thesis.

JACK: No. I gave a talk in Paris. I think it was on my lipid stuff.

JOHN: The *Euchaeta* stuff.

JACK: It had to be 1962.

PAUL: Yes, it would have been 1962, so you had finished all your data collection.

JACK: Yes.

JOHN: But not written it up.

JACK: Not written it up at that time, and the *Euchaeta* paper was nice and neat.

PAUL: One of the things I wanted to ask, because I'm not an oceanographer at all but obviously we needed it, and your paper was just a dog-eared Bible for us. The oceanographic community wasn't doing anything much more sophisticated than you were, it seems to me, you were right there.

JOHN: That's right. You were the one who pioneered that. Our oceanographer at Santa Cruz, I used to talk to him, I would like to know about the currents and stuff, and he said that's too inshore.

PAUL: But Jack did that, and it was quite unique.

JACK: I didn't know very much about oceanography at the time either.

PAUL: But you did it, and you learned a lot, and laid the ground work. Jim Barry and I did a lot of that.

JOHN: That was the only kind of oceanography done there.

PAUL: That's right. So I think what's remarkable about your work, Jack, is that you were way ahead of the curve in doing coastal stuff.

JOHN: How many people are doing that?

PAUL: It's now become popular because there's money. But at the time, oceanography was out there in the blue water.

JACK: The only thing we really wished we had thought about and had done is to bring an echo sounder down so we could watch the scattering layers. That would have been a good addition but it hasn't been done.

PAUL: I don't know that you would have seen anything.

JACK: Definitely, you could see the plankton down there. I'm sure you could.

PAUL: I don't remember it coming up and down, in my diving depth --

JACK: No.

JOHN: It would be deeper than that.

JACK: I assumed that during the summer, particularly during the spring when John said there was lots of light, you would have had some vertical migration going on. I did pick up some, in the vertical hauls I made. I couldn't do it frequently enough to come up with definite rhythms.

PAUL: Did you go in there with your background from Stanford?

JACK: I had one course in general oceanography and that's it.

PAUL: But you were intuitive about the questions. They were the most appropriate questions. The salinity, etc, and you understood the physics, I thought.

JACK: Yes.

PAUL: Very well. You understood where the water was super-cooled.

JACK: Well, not before I went down. No, I had no idea.

JOHN: But when you were getting minus 2 degrees water, you realize something is --

PAUL: Something is wrong, and it bothered you in the write up.

JOHN: That's right.

PAUL: And it wasn't a mistake, it was minus two point two.

JACK: Minus 2.2. I think that was the lowest.

PAUL: And that's when you see the crystals.

JACK: Yes. You got below minus 2.0 or 1.8. I think at 1.8, you got the crystals.

PAUL: I used the crystals to tell me which way the current was going. The crystals tell me it's coming from the south.

JACK: I think other than the Kiwis, I did the first sort of long-term current studies down there, too. With the Ekman current meter, and that's probably when I was watching the seals, because the Ekman, you had to lower it down and leave it there, send a messenger down, and turn it off. So I had 20 minutes to sit there and do nothing.

PAUL: But you were thinking about the oceanography --

JACK: I was thinking about the plankton, and the oceanography was just to support it.

JOHN: We were plankton biologists.

JACK: I had to know the oceanography to understand the plankton. It's not that I went down there to be a physical oceanographer; it evolved because I had to have the information.

PAUL: It was unique, and here's this guy from San Diego State who had played around with Carl Hubbs but you weren't a physical oceanographer.

JACK: The interesting thing, I would never say this until I'm retired, that I took a course in oceanography at San Diego State from a physiologist, who I'm sure was teaching this course, because it was assigned to him.

JOHN: He was forced to.

JACK: Because he was low on the totem pole, and that was my only oceanography. Because of the work I did in McMurdo and my thesis, I was hired as an oceanographer in my first job, and I taught oceanography for 25 years and I had huge numbers of students that went on to develop oceanographic careers. In fact in the Victoria region, almost every of them came through my classes, but I never had an oceanography class, but I learned an awful lot in McMurdo, and I read Sverdrup [The Oceans; their physics, chemistry, and general biology] several times.

PETER: One reads about the careers of Scripps scientists, and they started off and just learned as they went and became eminent. It's not like they had classical education.

PAUL: I dog-eared your paper when I was doing that anchor ice paper, and I still have trouble figuring out why lower level cuts off so abruptly.

JOHN: Everybody does. Did you see the new Mark Denny paper, on anchor ice? It's the first one looking at it seriously since your work, the anchor ice cuts off at about 30 meters, and we don't know why.

PAUL: He doesn't either?

JOHN: No.

PAUL: I looked through Jack's thesis that has an appendix, and I thought it must be something in there. I asked people, and they gave me a bunch of stuff and I came up with ---

JOHN: Got to be pressure.

JACK: I assumed pressure.

PAUL: Well, the pressure is off by an order of magnitude, a thousand meters, is sort of where you get the pressure. It's the super cooled water. But why the anchor ice doesn't go deeper ever, and it's true around the continent? You've got this 30 meter thing.

JOHN: So it's the other way around... it's super cooled water because it's near the surface.

PAUL: That's right. It's come up, in our case it came up from under the shelf, and it comes over the sill and starts dropping your crystals. Maybe you had it figured out. But why doesn't it go to say 40 meters? Everybody at the University of Washington that I talked to, I had to explain your paper to them. You were way ahead of everybody, and in a sense, I was trying to figure this out. I think it is still a really valuable paper.

JOHN: Yes.

PAUL: In every way.

JOHN: I was surprised, it's been sitting there for so long, and Mark Denny went down and saw it. He was looking at crystals and why they were forming on different things and why they didn't form on some animals and did form on other animals. They kept thinking they were forming, and I kept telling him, they're not forming, they're sticking.

PAUL: And once they stick, they make a flat platelet because of a piezoelectric process, I think we figured out. They go flat as they enlarge.

JACK: They attach on the wire, flared out flat.

PAUL: Right.

JACK: And they would be that big around sometimes, on cold days.

PAUL: Anyway, thank you, for, being there. You saved my career.

JACK: Purely accidental.

PAUL: It saved my career, it gave me what I needed.

JACK: I was using chemical techniques for salinity, and my concern was that I realized that if the Nansen bottle went down and took crystals in with the water, --

PAUL: They melted.

JACK: Right, and my salinity would not be correct. I remember doing an experiment, and it must be in my thesis somewhere, where I put plankton netting over the Nanson bottles, because that was my concern about the crystals, they were screwing up the data.

PETER: Paul, when you say, it made your career, you mean the physical?

PAUL: Understanding the benthic community in the physical sense, that's right. There's still another mystery in my mind. On the other side of the sound where you have really old ice, and it is 25 feet thick because it's a stable point, platelets form on the bottom of the ice and on the ice ablates from the surface. About a meter and a half a year, there's a fairly fast change, in the middle of that is a huge layer of fresh water. In the summer, there's a freshwater cell that goes down about 15 feet under the ice, and so the fresh water would freeze at sea level and it's sitting on top of minus 2, minus 1.8 degree water, and you don't have anything freezing. You can come down there in October, after the winter, and drill a hole with a drill or something, through that ice over there, and there's a lake of fresh water within the ice, and why doesn't it freeze?

JOHN: Fresh water

PAUL: Inside the sea ice.

JOHN: That doesn't make any sense.

PAUL: Over the winter.

JACK: How do you know it is fresh water?

PAUL: You can taste it, you can see it when you dive through it ... oh, it's fresh water. Tony Gow found it in 1963, but did not know how much is there.

JACK: Something in there keeping it from freezing.

PAUL: Well, maybe you can't taste it but there's got to be something there.

PAUL: Tony Gow, was there when you were there, and now he just says, it's super-cooled.

JOHN: No, there's crystals all over the place.

JACK: It could be super-cooled. There's something in there keeping it from freezing, because that's basic, zero degrees, fresh water freezes.

PAUL: That's what I understood. In 1963, Tony was bringing it over. He discovered it, and Gordie [Gordon Robilliard] and I discovered it when we dove through it. He came in October of 1963 with water samples, and we ran them, and they were distilled. He couldn't believe it. It was a big thing for Gordie and me to dive into and that was in 1968, 1967. But, it's fresh.

JACK: Something in there, some organic molecule or something.

PAUL: I wanted you to have a mystery issue.

JACK: Definitely is a mystery, I'm sure it's not fresh water.

JOHN: One of your main things for your career, was having Gordie, right?

PAUL: Yes.

JOHN: I mean, there you had somebody you could work with.

PAUL: Yes.

JOHN: That's really, really crucial, to have a couple of people who you can depend on.

PAUL: You guys worked together. You had Jack and Dearborn.

JOHN: That's right.

PAUL: And Gordie and I worked together.

JACK: I think when you go back to the very first question you asked, it makes John Dearborn's work even more remarkable because he had nobody to talk to in his first year.

JOHN: That's right.

JACK: We worked close as a group and could discuss things back and forth. But John didn't.

JOHN: That first year,

JACK: That was remarkable that he did the sorts of things he did without any feedback or encouragement or anything. We constantly talked to each other.

JOHN: That's true. He had no encouragement either. I mean, what Curly wanted him to do, and he was Don's student and Don I'm sure was thinking, this was a little bit removed from what he would do.

JACK: Don was a pretty straight arrow about what he wanted to do.

JOHN: He was, he wanted people to work in the intertidal, period.

PAUL: Dearborn, not only did he work alone, but he was a damn good invertebrate zoologist. He found things, that I've never seen even though I looked, things like Cephelodiscus and Rabdopleura and he found a fair amount of things like priapulids.

JOHN: Right.

PAUL: I don't know how he found them.

JACK: He was meticulous. He really was meticulous in going through things.

JACK: That's one of the big changes that occurred, was the group size increased, and that helped a lot. The other one, we were talking earlier about another reason why you felt you didn't get cooperation and we did... we didn't ask for very much. It was given to us.

PAUL: I didn't ask either, and that was a problem.

JACK: We didn't want anything from them.

JOHN: We made all of our own stuff. I could weld. I learned to weld in high school, so all of our traps we welded together.

PAUL: You welded your own traps?

JOHN: You just go to the Navy shop and use their equipment.

PAUL: Welding is easy enough, but my traps were wired.

JOHN: I made solid traps; you have all that equipment up there, and supply area.

PAUL: Yes, I helped with Graeme Johnstone, and I built a fish house, a really good one I was very proud of, in that garage. But, in the 1960s, 1964, there was a geologist named Bob Rutford who became quite important, and maybe it was 1963, but in those days the geologists were in that building, building the boxes and everything. We all took care of ourselves. When the chain saw broke, I had to learn how to take it apart. My sense was, somebody put this together, I should be able to see how it works. They were good. I remember Rutford up there building the boxes for all the specimens, and just in there by himself, a young guy, he had a big pipe. They all smoked a lot and somebody came in and told him the Navy had

cancelled all of his flights. He says, no, and he fought with the messenger, and the poor guy just beat it because he was just telling Rutford. He just sat there, without saying anything. I'm sitting working on the chain saw, and his jaw started working. He is just staring at me, and his jaw is working, and the end of the pipe fell off. He bit it off! So, you know, Rutford can attest that the Navy wasn't very cooperative.

JOHN: We did do bartering sometimes with the Navy.

JACK: Yes. Remember the beer episode.

JOHN: Yes.

JACK: They used to store the beer outside one of the buildings, and, being scientists, we watched the beer decreasing, and we calculated when they would run out of beer. It was quite awhile before the support ships came in, and so we bought a load of beer and had it delivered to the USARP barracks. I know my room was just flat from the bunk down, it was just beer cases, and I think your room was the same. This was a lot of beer. Then when we wanted something done in the summer, we'll leave a case of beer out there for you if the ice house is plowed. Done. I think the base ran out of beer about October, and we had it throughout the summer.

PAUL: But you guys ate well?

JACK: Yes.

PAUL: And you had the beer.

JOHN: Very well, and we had the beer. We had a weekly run of buying things. We could buy hardware.

JACK: George had the keys to the USARP locker too and he was generous. Any time --

JOHN: That's right, but when we returned in the '80s it was restricted.

JACK: Any time we had a party, we could get a supply of ethanol to make punch.

JOHN: George was good about that. That's right. That's a different time.

JOHN: We also had those photographs of nude women, we could give to the Seabees and oh, we'll give you this photograph, if you go out and plow tomorrow. And, those were really worth a lot.

JACK: Yes.

JOHN: And we had the negatives.

JACK: Which we inherited from Ollie, I think.

JOHN: Some of those were Danish girls. They were really risqué for those days, it actually showed pubic hair and that was pretty exciting. We had negatives, so when we needed something, we'd just go in the dark room and make a couple of prints and go out. We took Vern into the dark room and I showed him all those negatives. I said, these are worth almost more than anything on the base. You can get anything you want from the Navy. Oh, filthy, he said, and he threw them all away. What are you doing? I said. Yes, I was horrified.

JACK: All your barter power...

JOHN: I didn't care about the photos themselves, not too much anyway.

PETER: You were trying to get science done.

PAUL: I know about the Tucker snowcats, and that Tucker snowcat is a cool machine.

JACK: Well, I had a tiny one that was really cool.

PAUL: I love those things.

JACK: I love them, too. I didn't like the Nodwell.

JOHN: The weasels were fun to drive.

JACK: We used to go out and get them on a spin, when there was wind and the ice was clear --

JOHN: You could slide around.

JACK: Pull one of the levers and you just spin.

JOHN: They didn't like it when we did that. Sometimes the tracks would come off.

PAUL: At least what happened with the track master, when one of the Navy officers was spinning, and they spin like a top, but he did it with a track master, and it tipped over. The fuel tank spilled onto the exhaust, and the thing blew up. Blew him out of the vehicle. He survived. So spinning a track vehicle, it's got a risk factor.

JACK: Well, weasels are close to the ground. Transportation was always a problem, and sometimes, right after summer support left, I got a small two-person snowcat which was like a model A snowcat, had a little Chrysler engine in it, and it was a tiny thing. Not like the Tucker snowcats and not like the big black ones. This was a tiny guy, and I had it all winter, and it was my snowcat to use. We went up to Arrival Heights on it to watch the sunrise one time, and if you wanted to go anywhere, we just grab it and go off for a drive.

PAUL: Did you have a block engine heater?

JACK: No, we had Herman Nelsons.

PAUL: Oh, you put the Herman Nelson on them.

JACK: And a can of ether. Nodwells came with a little ether injector, and it never put any ether in, but the can of ether worked just great.

JOHN: Just poured that in.

JACK: Boom. Here we go.

JACK: Tell the White Island story, too, when we --

JOHN: You know, I only remember a small part. But Jack and I, we had a lot of time, after we set the traps, and so we were exploring, up there. We went out onto the ice shelf itself, because we were kind of behind where all the ice kind of crunches up together.

JACK: Pressure ridges.

JOHN: Pressure ridges. We got out of the pressure ridges and got out on the ice shelf and it was just as flat as you can see. It was a beautiful day and we had banana sled and some stuff on it. I don't remember that we were out looking to blow a hole.

JACK: I was carrying explosives.

JOHN: And there were ice cracks in the ice with snow covering them, and most of the snow was blown away, but there were areas with snow on it, and we were walking side by side, and Jack stepped right in the middle of a snow covered crack.

JACK: Well, you pointed it out, and we had some communication difficulty. I thought you were pointing out where you wanted me to step. It was windy, and

John pointed out to step there, and I thought that's where I wanted to step. Down I went.

JOHN: I looked down and I couldn't quite see the bottom but Jack was dangling there looking like, what's ---

JACK: What happened.

JOHN: Got him out of there as fast as I could.

PAUL: That close? Because I went through one of those at Turtle Rock, and you don't have a chance, I mean, I'm down. But I just went down a little ways.

JOHN: This was the ice shelf so it was thick ice, I don't know how far it was to the bottom.

JACK: As you say, you're just gone. I don't even remember, I remember you pointing to the spot, and I remember stepping on it, and that's it.

JOHN: I just remember looking down, and you were not looking very upset about it and I was, like, God...

PAUL: That's what happened in the Worst Journey [Apsley Cherry-Garrad "The Worst Journey in the World"], those guys kept falling through those things because they were out in the windless Bight and you couldn't see.

JOHN: Couldn't see.

PAUL: They kept going down so they had their skies tied to the sleds to make a T, and they were hanging, and it happened several times.

JACK: This was just a little narrow crevice, and it was not a problem. I remember stepping on that spot, definitely, and that was it, gone.

JOHN: I remember seeing you step on it and thinking, God... because we were pretty careful about watching where the snow was.

JACK: That's why I stepped there because you obviously saw something and pointed, step here.

PAUL: Where Jeff Rude went through and died, I don't think they could see it. I was there a couple of days later, and there was just a hole. You didn't see the crack. It was a tight crack. They had a big storm so you had that really hard snow that was very firm, and it just looked the same. He just parked his vehicle on it, three or four feet further, it would have been at an angle and he probably would have lived. They stopped to drill, and down it went.

JOHN: I think those guys that were up by Arrival Heights, somewhere over here, we lost those two guys, that was a crack, too, wasn't it? I think you said it was on your time, sometime after we were there?

PAUL: Yes, some hikers fell through.

JOHN: That was the end of anybody being allowed to walk up there.

PAUL: That's right.

JOHN: Before that happened, we went everywhere.

PAUL: That was 1966, maybe, when that happened.

JOHN: I know when we got back there in the 1980s, we weren't allowed to walk up anywhere in there.

JACK: We used to go up there all the time.

JOHN: Walked up to Arrival Heights and Crater Hill.

JACK: In fact, there was a good road that went up there and came out that way.

JOHN: That's right.

JACK: I wish you would have been there for my Ph.D. defense, Paul, it would have made it really easy. I'm sure they didn't share your opinion.

PAUL: They didn't know what they were talking about. Nobody did. Nobody at Scripps would have done that.

JACK: I have the feeling that they just gave me my Ph.D. because obviously I did a heck of a lot of work, whether it was of any value or not.

PAUL: Who was on the committee?

JACK: Curly, Abbott, who was the environmentalist at that time? Paul Ehrlich.

JOHN: You had to have somebody on the outside.

PAUL: Nobody who knew anything about oceanography?

JACK: No, nobody there. Fortunately, they couldn't evaluate it. They did a lot of numbers here.

JOHN: Who was there for mine? I went up to Turtle Rock, and got those animals that were eating seal shit. You can look down and see clumps all over the place, all the turds all over the bottom, and that's what the sea stars were eating. Well, how much nutrition do you get out of a seal shit? That was the big question on my orals.

PAUL: Well, now, they have these pictures, and my argument is, very little over the long term.

JOHN: Of course.

PAUL: Very, very little. But the *Odontaster* likes a seal turd, no doubt about that. But what you have in the cracks are the brown streak of diatoms in there, and it's all diatoms, fortunately.

JOHN: Right.

PAUL: So the whole business about recycling seal turds, it's, well it's nuts.

JOHN: It's not going to be very much, and there's not that many places where there are piles of it.

PAUL: But there are still proposals now to study that.

JACK: One thing we didn't mention and that was an unknown fact, really, that this brown layer on the ice was diatoms.

JOHN: That's right.

JACK: They used to call it seal shit. On the bottom of the ice. The pieces of sea ice would turn over when the ice breaker plowed through it, and it was obviously seal shit. We didn't know when it formed or how, and I think when we put the photo cell down and we got light measurements, we realized these were growing diatoms on there.

PAUL: It's a whole ecosystem. Careers have been made on that.

JOHN: After the winter, the new ice is translucent. We see the bottom through holes in the ice, and it disappeared, as the diatoms grew on the underside of the ice, and blocked the light.

JACK: I had the light meters down at that time. We just drilled a hole and modified the light meter so it would go down the small hole, using the SIPRE ice

corer. I would just unfold the light meter and we froze it in. We had no way of knowing whether it was still functioning and the light decreased rapidly. Of course, that corresponded with John's visual observations. Then, when the water warmed up to balmy 0.5 degrees or something, it cleared up, and I think that was the first time people realized how dynamic the cover was.

PAUL: That was the first time, yeah, it was the first time anybody knew that there was a problem.

JACK: Any of these things would have made a wonderful Ph.D. thesis all on their own.

PAUL: Well, the sea ice ecosystem, there's been several careers, probably twenty people in Alaska.

JOHN: Goldman certainly built on that, and Neal Sullivan.

PAUL: Rita Horner, there's a whole series of people who have done that, and the marginal ice zone was all built around this sort of thing.

JACK: I think when we went down, people thought the bottom of the ice looked like the top of the ice, essentially.

PAUL: Fair enough, why not.

JACK: And that was it. Didn't realize how dynamic it was. We really were amazed when we got all the ice crystals up, because we didn't understand where they came from.

JOHN: Right, right, or even the break out of the sea ice, and how important that break out was as far as the productivity up and down the sound.

PETER: John, you mentioned seeing the rocks and the animals underneath the ice. How did you come to understand that that was anchor ice rafting?

JOHN: How would it get up there?

PETER: You just instantly realized that the ice was lifting it up off the bottom?

JOHN: You have to.

JACK: I think we talked about it in the lab. First time was, we talked about it at your station, how in the hell did they get up there. And we discussed it --

PAUL: Did you coin the term anchor ice?

JOHN: No. I don't think so.

JACK: I think John Bunt did.

PAUL: I think you used it

JACK: I think John Bunt used it. He made the term upontic, so he certainly knew about that, and I think he did use anchor ice. We were more concerned about lifting.

PAUL: You published your thing as a letter.

JOHN: Well, that was the thing about the fish on the ice.

PAUL: I was doing due diligence to my predecessors and I found that. When I wrote my paper, I thought I was pretty much on my own, except for your observation, and we had Curly and Swithinbank paper. Debenham had it, and I talked about these things. I didn't mention Bunt and I don't think I looked at his stuff, but Swithinbank wrote me a letter after that paper, and said, that explains it.

JOHN: Right.

PAUL: ... and it all came together, to the old man and that made me feel so good.

JOHN: That's great.

PAUL: So he'd been sitting there for 50 years wondering how those fish got up there. Well, everybody thought that the ice just came along, because it's not only fish, it's fragile invertebrates. A whole benthic ecosystem, and the literature had it, just that the ice hit the bottom.

JOHN: Scraped a few things off.

PAUL: Scraped them up.

JACK: That was our first thing, we said, oh, that's scrapes, and when we cut your ice hole, realized that we'd seen, there was no ice there. We knew the history and there was no scraping or anything going on, and there were these animals in the ice.

PAUL: .. but yours was just a short letter to the editor.

JOHN: I didn't think it was very interesting or very important. I just saw it in the Scientific American article about how they were trapped by ice going all the way to the bottom, and I said that's not necessarily what happened.

PAUL: Again, you guys were on top of things, you were talking and thinking. More so than any time later, I think.

JOHN: Maybe more so than ever since either.

PAUL: Waxing philosophic, would you actually buy into that, for that five year period, maybe, that was some of the most creative work you've ever done?

JOHN: No. I don't know. I've done other things that I feel pretty good about, too.

JACK: Yes, I would not put it as one of my intellectual peaks of my career, but we did a lot of thinking of new things.

JOHN: Yes, we did.

JACK: It was very innovative.

JOHN: One of the things about going to a place like that and being among the first is that there's all these questions that you're thinking about, and you're seeing for the first time.

JACK: I think one of the things was, which was really good, we had nothing to distract us. We were there 24 hours a day.

JOHN: Not trying to do TAs --

JACK: ... and didn't worry about money or food.

JOHN: You knew money was being put in the bank for you. I was secure financially for the rest of my life. I didn't realize that was going to happen, but I almost got thrown off the ice, when I first got down there. I went to New Zealand and took some money out, had it changed from my bank account, Bank of America in the States. I had a small amount of money in there, supposedly all of my checks and everything were going to be put into that bank account. I got down to the ice and the check from New Zealand bounced, and the Bank of America said I didn't have any money in the account. Somehow, Stanford had not put it in there. Next thing I knew, Curly was on my ass, saying, you overdrew, and you better get that money in there. I went back and said, no, you put the money in there because I don't have anything to do with it, you were supposed to put the money in my bank account. He said you take care of that right now or you're going home. He was serious, and it was serious. It was really, kind of up in arms for it, because I left it for that bank account to be filled from my salary, and he wanted to send me home. That was the only, probably the only real issue that I had.

JACK: That must have been very soon after you got there.

JOHN: It was, it was very soon. And the other thing, do you remember I also slipped on the ice once and sprained my ankle really badly? I could hardly walk. That was in the first summer too, and I was hopping around, and they were talking about, you can't be here for the winter.

JACK: Yes, I remember that. Now that you mention it, I more remember you talking about the banana sled when we had the fire watch, everybody always went around, but, once in a while, John Dearborn would drink and he didn't drink at all, basically, not with the rest of us. He used to drink reasonably infrequently, but when he did drink he would get really drunk.

JOHN: He'd get really drunk but he wasn't a drunk, he only drank a little bit. The next day he had no hang over or nothing.

JACK: He was really susceptible and he would almost pass out with a glass of scotch or something.

JOHN: He'd also trash up the furniture.

JACK: He would insist that he had to go on his rounds, fire rounds. So I remember putting him on a banana sled and dragging him around through all the buildings, because he had to make his rounds, okay, we'll make the rounds, and he's passed out on the banana sled, oh, okay, fine. But, dedicated...

[THE END]

PETER: I'm Peter Brueggeman with the Scripps Institution of Oceanography Archives, and today is January 21, 2013. I'm speaking with Paul Dayton, and we're going to talk about marine biology research diving in McMurdo Station, Antarctica. This interview is part of several oral history sessions in which Paul has participated, and we've spoken with Gordon Robilliard, John Pearse, Jack Littlepage, and Jerry Kooyman. Paul spoke in the preceding oral histories about his experiences, but we haven't really focused in on Paul Dayton yet, so that is what we will do today. This oral history isn't about your whole career, so we are going to jump forward to how you became involved in Antarctic research.

PAUL: I will jump over matters that I remember from preceding oral histories [US Antarctic Research Program Oral Histories. Scripps Institution of Oceanography Archives collection 2012-14]. There are two items I'm giving to the Scripps Archives [US Antarctic Research Program Oral Histories. Scripps Institution of Oceanography Archives collection 2012-14]. One is a history that I wrote up for my children that relates to this, entitled "1963 Memories." The other, entitled "Antarctic Memories of an Old American," I wrote for an Antarctic magazine published for the layman in New Zealand in 2010. I wrote it without a lot of preparation, and I see they misspelled my name as Drayton, but it does give a bit of my own history that I typed up for them. So those are in the record, I won't really go through them. I have some agendas that I want to do. Mainly, there is some threads of change, the political change in scenery at McMurdo that I think is important and interesting. I started my interest in Arctic archaeology in 1960, so I had a polar interest as an undergraduate in Arizona. I had no thoughts of ever going to the Antarctic. In those days, in the 1950s, we really all knew about the heroic age of Antarctica. It was close to us, it was very personal in a way. And so when I got an opportunity to go work in the Antarctic for a year for Donald E. "Curly" Wohlschlag at Stanford, I jumped at the opportunity and went.

So some of my memories are written down there [1963 Memories], the types of things that I thought my children would be interested in. In those days the Antarctic polar program had an orientation meeting that everybody attended, and especially those that were wintering over, had an extra day. The winter over group was treated to a talk by Sir Charles Wright who was on the Robert Scott expedition, the last Scott expedition, and Wright and the others went down to find Scott's body, recover the diaries and things. Wright gave a talk to our group. He had some old lanternslides of penguins and things -- he was quite a famous physicist by that time. I didn't know him professionally, I just knew him as part of Scott's expedition. There was a free afternoon and people went for walks. I started out for a walk, and it was in Shenandoah Park, and it was a nice place, a nice afternoon. I saw the old man sitting there by himself, so I went and talked to him for quite a while and got a more personal glimpse of their life.

So when I got to McMurdo, I was overwhelmed with the sense of adventure and the to me very real magic of this unique history. We visited the buildings [of Antarctic exploring expeditions], and it was not like a museum, it was in my mind as though their ghosts were still there, talking, laughing and inwardly missing their families. Today they've all been cleaned up and much changed than what they were like in 1963, but to me it was Scott's home, and Sir Charles Wright's home, and it was a more personal thing back then.

PETER: It was Hut Point and Cape Evans you saw?

PAUL: Cape Evans was their home, and also they had come in and out of the Discovery hut [at Hut Point]. They were aware of and had used material at Shackleton's hut [at Cape Royds] because Shackleton was between the two Scott expeditions. The huts were pretty well talked about and known.

PETER: You went in and saw them and it resonated with you?

PAUL: Yeah, yeah. We went in and saw them before they had been completely restored. So there was still stuff from the second Shackleton expedition lying around, and all of that got erased by the New Zealanders when they cleaned up the huts. They did a wonderful job cleaning up the huts, but probably correctly reset it to the Scott occupation rather than the second Shackleton expedition that had lived in for several years.

PETER: They wanted to take it back to Scott?

PAUL: Yeah, so the things that we saw in 1963 were probably different, were I'm sure different from what John Pearce, Jack Littlepage and John Dearborn saw in the 1950s, and in 1960. But it was very different from the cleaned up buildings that you see now.

This feeling of intimacy never left me, even in 2010 when I revisited the huts, to me they were sacred spots where people I feel I knew and understood had spent the most important days of their lives - in some cases the last days of their lives. It is always emotional for me. Now with the book "The Lost Men" I finally understood the wall inscriptions by Joyce and Wild at Cape Royds.

So this is a sort of personal history. For me the sense of the early explorers was always there, a sense of magic. And any naturalist, especially me with all my experience and background in so called harsh environments, just has to be awestruck with the opportunity to experience the natural history of the Antarctic. It is perhaps one of the must humbling yet inspiring opportunity in the world for a young naturalist. But I sense that people know this and a discussion of spectacular and exciting nature is not really the objective of an oral history.

Because it has been on my mind from past discussions, one of the things I wanted to get into this oral history was my perspective of the train of tensions that went from the Navy to the NSF to the scientists, and it is

more of a political sense than the real research that we did. We already talked enough about the research earlier.

PETER: Yes, we want to explore your history, and you want to talk about the administration of science at McMurdo"

PAUL: Yes. First, before I go any farther, I really need to offer a disclaimer. Anybody who spends almost 70 months of their life in a place like McMurdo will have strong personal memories and this is especially true of me. Everybody who has worked at McMurdo will have memories and thoughts that are very different from mine. This is especially true of support people, and I am not sure how much opportunity they have to record their memories and that is too bad, but anybody reading this really should find a copy of the big anniversary book put out by the American Polar Society: Seven decades and seven years of service to the polar community. It is some sort of anniversary edition of the Polar Times. It is an upbeat memory written by and collected by people, largely US Navy but also civilian, who have loved the Antarctic as much as I have and they have done a great job of collating and publishing a Polar Times since 1935. In recent years Brian Shoemaker, a Navy helo pilot and then commanding officer in the 1960s retired and has dedicated the rest of his life to recording and collating history. I will put my copy of the Anniversary Edition in the archives and anybody reading my drivil really must dig it out and read it carefully and check out all the references to real history in the volume.

Sometimes I had my problems with support people, but their voices should carry equal weight with mine and it is interesting as it describes important events essentially devoid of science, so it is an alternative view to my science based perspective. Our science-based perceptions are somewhat selfish personal perspectives, and this is true of me. All scientists have a strong sense of focus and drive, and this is especially true of those working in the Antarctic where there is an almost desperate drive to accomplish as much as possible in time much limited by extreme logistics. It is not very easy for us, especially me, to take a step back and understand the tough challenges faced by the managers. But it is also interesting to evaluate the options and roles of science managers. I hope I can be balanced.

When John Pearse and Jack Littlepage talked in their oral history, I mentioned that there were tensions with the Navy, and they were surprised because they got along with the Navy okay at McMurdo. So I have been thinking about that.

I think what actually happened in the difference in perception, just between 1961 when they were there, and 1963 when I came, that the Navy was there very early in the mid 1950s building up the IGY base. It was an heroic effort that the Navy did, and they had some of their very best people. The enlisted people really were volunteers, they were pretty enthusiastic, like we heard in the earlier history. The officers were

some of the better ones in the Navy. The Admiral and high-level officers the Stanford guys knew were very good.

By the time I got there in 1963 the operation was rather routine. There was no need for the high-level publicity and heroism involved. The buildings were built and it was just keeping the place going, and the enlisted men were not volunteers. They complained a lot about being forced to be there, that they did not want to be there. Anywhere but here. IHTFP was all over the place, it's "I hate this fucking place." They scrawled that everywhere. So that was what I sort of walked into expecting that everybody worked together very happily! There were tensions at the higher levels that I didn't really understand at the time because I was just 21 or 22.

The NSF officials were trying to get control from the Navy because it really was supposed to be a science operation, not a military operation. The military was resentful, and I ran into that without understanding.

There were also unnecessary rules such as you can't go down into the dump and get the things you might want, because they didn't want civilians seen there scavenging perfectly usable material that they were throwing away; it was embarrassing to them.

My main mentor that year was Art DeVries. Art surely is one of the most interesting characters to spend a career in the Antarctic. He wintered-over in 1961 or 1962 and then again in 64-65. He was my mentor, and he took me to the dump and had me help him get tracks off of the weasels, because Curly's boys (us) had what we called a Polecat. It was basically two Korean War weasels put together, small tracked vehicles that blended together. I have a lot of pictures of it in the archives.

Art explained that we needed spare weasel tracks because we went through our tracks and broke them. We went in on the WinFly, and it was really pretty cold, but we went down to the dump and collected some spares. I learned how to replace tracks, and I had to do it a couple of times when I wintered over with various vehicles. Conceptually it isn't hard. The problem is, it is just cold, and you've got to break the nuts free and take the track off. My point is that we were taking care of ourselves to the point of anticipating problems, and we were recycling material from the dump, and putting it back to work.

In the 1960s then, from my first year 1963 to 1967 and 1968 when we came back, I think that the problems were not so much with the enlisted people. The enlisted people that worked with us were could be quite helpful. We had enlisted friends that came and spent a lot of time in the Bio Lab (John Svenson was an example who comes to mind), and it was common for us to have Navy guys that were good friends and helpful.

For example, when I wintered over, there was a guy who helped me with the refrigeration unit for the fishes, and he was in our lab a lot and was very helpful. They had a search and rescue program, and for that they had

to have parachute riggers. Even wintering over there was a guy that was assigned to make parachutes. Well, nobody used the parachutes, so the poor guy was pretty bored, and he became our friend, and he was a good friend of mine.

Tragically, when the winter was over, I think he went home and looked the wrong way on a New Zealand street and got run over by a bus... the dangers of looking the wrong way in New Zealand.

My point is that many of these guys were good friends. Most of the officers were great, especially the doctors, those guys at that time had to go into the military as part some deal with medical school training, it was something they owed the military, but they weren't making a career out of it, they weren't lifers by any means. Most of our officers' lower-level guys (lieutenants) were the same, it was clear that they were just putting in their time from having been in ROTC or something. They were getting out, and they talked about it all the time. It was no secret that they were getting out. They were put in the Antarctic because the military didn't really need them somewhere else.

Then the military had passed-over officers, the captains who were, in my times in the 1960s, two seeming alcoholics that were really pretty dead for the military. And so I think by 1963 or 1964, McMurdo was a dumping ground for the officers who were not committed to their program, and this is different from the earlier years when it was a high visibility and popular place to be.

PETER: Admiral Byrd... the exploring of Antarctica, the IGY, I see what you are talking about... then it became routine.

PAUL: It became routine and many did not like it, and they dumped the people who were getting out or who were deadwood in the Antarctic.

PETER: How long were their stays?

PAUL: I think that they were all committed to the program for two years.

PETER: That's got to be hard on a lot of people, whereas the scientists go in for the season. Right away, I think there would be automatic hate from some.

PAUL: Some may have hated us, probably most did not, the COs did winter over, and they were not happy campers.

PETER: They probably resented you,... the scientists coming and going.

PAUL: I am not sure if it was resentment, but they probably saw us as part of the reason they had to be there. I just was wondering what was wrong with me when Jack Littlepage was having all of these happy memories.

The exception -- and I put it in the preceding oral history interviews so I won't go into it in detail here -- in the 1960s, the helicopter pilots were just superb. They had to be some of the best pilots in the Navy. I think that they pulled rank to get out of Vietnam and come to McMurdo, and they loved it. They loved to fly and they were very good. They were all good and very enthusiastic and I wish I remembered their names. Jim Brando is the one name I remember, at least phonetically. He was amazing.

I have this one really happy memory of getting up one Sunday morning after there had been a bunch of partying, and I hadn't partied so I was getting to work and had things to do, I was up pretty early. It was a beautiful day. In the summer, the sun doesn't go down so it's always sunny and nice -- or horrible -- but it was sunny and nice and calm that day. And there were two pilots standing out there near the Bio Lab waiting for somebody to walk by, and I was the first one to walk by.

They grabbed me, and they said, "Look, it's a great day for flying ... can't you think of something you want to do?" I had been all over the place because I was friends with Tom Berg and other geologists and the insect people, so they knew me very well. I had helped all of those other guys, so I knew some places to go, oh yeah. I suggested how about Don Juan pond and the sand dunes?

PETER: In the dry valleys?

PAUL: The dry valleys, yeah. So I found Tom Berg who made it legitimate and off we went, and we spent the day. I went to Don Juan pond, which is a really interesting place that they don't let anybody go there anymore. The sand dunes were really interesting. It was that sort of life for the pilots. So the helo pilots in the 60s and the 70s were really wonderful.

And again, in the early years when I was running Curly's fish, we had to keep the tanks at -1.5 [deg C] is what we were aiming for, and that's very, very close to freezing [for seawater]. And if the cooling coils started to ice over, it changed the salinity and screwed up the fish. So it was a really delicate balance of maintaining those horrible tanks. So we had to change the water often, and we had to keep the temperature just right, so the refrigerator guy was really helpful to me because I had the chore of keeping the tanks going.

So that was my sense of this job that I had in 1963 and 1964, I was just a fairly humble technician for Curly doing his work. But again, to me it was an adventure. That year was just hugely important to me. I was very enthusiastic, and I learned to become self-reliant. With Art's help, I learned to repair the Homelite generators, chainsaws and pump as well as the snow machines. They were Polaris at the time.

PETER: It so different from today where all of those things are provided and supported.

PAUL: That's one of my main things is that I think that ecologists and the field people should be able to care of themselves to some extent. I had to do it myself, and if I needed to cut a hole and that was my job, the saw was there, there was a general workplace that you could go in and the tools were there. We all left them there and it was a fairly orderly place, and I fixed things when they needed fixing. I knew some things, I was a field person, but with Art who could do anything, it was just the necessity of breaking things down and figuring out how carburetors worked. It was really good for me, I became self-reliant.

One event I remember, it's one of my memories that is really in clear Technicolor in my mind. In those days the winter got much colder than now. And we several days that it was -70 or below on the ice or over by Scott Base. And -40 is cold enough, at -40 things are different. But at -70 or -75, it is a pretty interesting place.

I was way out, probably four or five miles from the McMurdo base at the fish house where I was trapping the deep-water fish. Thermometer bottomed out at -70 and I don't know the real temperature. We had an old Dodge Power Wagon that I used because it had big balloon tires, it could go fast and it was nice. It was a World War II truck that had stayed alive at McMurdo, so it had its problems with just being worn out. You always left your vehicles running. So it was running, and I was heading back to the base from my house when the old Power Wagon just stopped. At that temperature you know to be careful. My memory was that it was really pink, it was just that twilight zone and sort of in the middle of the day, it was maybe mid-August. But when it is that cold, it is really still and clear. And it's interesting, because the ice is cracking, the air is cracking - there is a lot of noise. So while it was very still, there are noises and pastel colors. My memory is that there was sort of a little fog, which I think is ice crystals in the air that had frozen out from the atmosphere and were sort of floating around. So it was a little hazy, but just really cold, and the vehicle was stopped. My memory is not of concern but of the magical almost ethereal beauty of the place and situation being a challenge, but a comfortable one.

I wasn't worried because I had survival gear. I had the bear claw mittens and all my gear, and I could walk back, but I wanted to bring the truck back because how else was I going to get back? We didn't have anybody coming to rescue us in those days. It was up to me to fix it if I could, and if I couldn't, walk back and then find another vehicle and tow it back and work in in the garage where Graeme could help me if necessary.

PETER: You had a radio with you though, right?

PAUL: No, we didn't have radios... there was nothing.

PETER: It's so different than today... you're really out there.

PAUL: You really are out there, and you had to be sort of self-sufficient. I wanted to drive it home so I didn't have to spend a whole

bunch of effort towing it back and putting it in the garage and fixing it there. So I just figured that like the fuel lines to the fish house, that there was some condensation and freezing in the fuel line.

We always had a little propane torch that I used to thaw out the fuel lines. Fairly often the stove went out in the fish house, and I would propane-heat the fuel line, they were just metal, and I would heat it up and melt the ice that blocked the line. So I just set about doing that with the pickup. I opened the hood up, removed the air cleaner, and was in there with my little propane torch.

PETER: You were heating the carburetor float tank too?

PAUL: Yeah, that's right, first the fuel line and I sort of hosed it down with the torch and then the base of the carburetor, got it nice and hot, with the gasoline hopefully coming in. For these contingencies we had spray cans of ether, so I sprayed that in the carburetor. I didn't put the air cleaner back on because that was going to take some time, I was more interested in starting it, so the air cleaner was in the truck. I filled the carb up with ether, jumped in, and cranked it over, and vroom, it went fine... and went home.

But this is the way it was. Twice I had tracks fall off. They never fell off the polecat, but they fell off Nodwells. So now you are driving along on a tracked vehicle and the track falls off. So again, you just have to fix it. We had jacks, I knew how to do it. It just takes a ratchet wrench and maybe four or six or maybe eight little bolts on the track to undo it. You jack the thing up and put the track back on, do the bolts, and it's good to go. The tracks fell off because they were old and expanded, but they got me home. I could do that, I did it twice and it was like an hour, and you were dressed for it, and you were unhappy. You got frostbit and your face would freeze a little bit, but you got home.

Graeme Johnson, the really heroic Kiwi guy who was wintering over and could do anything for me, looked at and figured that it is just stretching, but we only had two tracks for the Nodwells that we had removed from the dump. We had three Nodwells and we were saving the new tracks, and so the trick was then to drill more holes in the old track and just tighten it up a little bit.

It was that sort of a situation, and a kid like me that was enthusiastic about being there just learned. It changed my life, because when I came home and had children and we would go camping all over the place in my old Volkswagen, I knew I could fix it.

PETER: It must've had some ramifications for your science too. You must've had a real attitude of trying to make things work, whether it's gear or field equipment or whatever. I don't mean in Antarctica, I mean here.

PAUL: Maybe, I am pretty lame with modern things.

PETER: Building things.

PAUL: Yes and no, I am pretty lame, period, and have been pretty dependent on competent people like Jim Barry and Ed Parnell to hold my hand. But the year on the ice at least made me a much more independent person and self-reliant than I had been.

Another example for the science-related stuff, I mentioned that we had to have fresh seawater for the fish tanks, and we changed it very often, like every week for these big tanks where the fish were. There was a big plastic tub that we put into the back of a Nodwell. The Nodwells are a big tracked vehicle that had a bigger carrying space in the back, and we would trundle that down to wherever I could find open water, which eventually became the fish houses. It was a fairly long trundle because they were out in deeper water.

The one time I'm thinking of was when the ice had gone out and there was a thin layer of ice that was hard enough to walk on, I thought. But again, you put the water into that tank with a Homelite pump, which because it is metal, the impeller and things are all in a metal case, and it was colder than hell. So you had to blowtorch the bejesus out of that before you primed and started the pump. You have to open it up with a wrench and have to have it warm so it doesn't freeze, pour the seawater in to prime it, and then crank it and get it going, and it has to start fairly quickly.

So it's fairly important to get it going, and you don't want to spend a lot of time fooling with the hoses. You get the hoses and everything all prepared, and then you do that routine. So it was all sitting there ready to go, everything was prepared, but the hose -- I had to walk out on that thin ice, and it was down at Winter Quarters Bay right near the Discovery Hut. I had the Nodwell there idling away, it was about -30 or -35, and it was windy, it was cold. The ice seemed to be about three or four inches thick, I did not know for sure how thick it was, but I needed to get the hose out there into the water. So I carefully walked out maybe 10 or 15 feet, and fell through. So now I'm in the water, and I've got some boots on. Instead of my thermal boots, I used regular boots because the operation was so messy, and the boots were hanging me up and I couldn't swim. So I had to take them off and throw them up on shore, and then I had to break ice. The shore was all broken up, I couldn't get out of the water there. I was actually sort of flopping through the ice. I was remembering that people said, oh, you're going to die in 30 seconds. I was dead many times over because I was in the water probably for 10 minutes, and this 30 second rule is just crap. So I was in there for quite a while before I found a place where I could actually climb out, with my icy fingers.

At this point I'm in my socks, and I'm completely soaked. By the time I got back to my boots and poured out the slushy water that was in them, all of the rest of my clothes were frozen - that is the outer layer was

covered with ice. It was like armor as the ice protected me from the wind. I realized that my feet were ok, I got them into the boots. I stomped around a little bit and I realized I was okay. I didn't need to panic, I didn't need to get in the truck and I didn't need to do all of the panicky things that I thought I might have to do while I was swimming. So I just went ahead and filled the damn tank. I cracked and crunched, and every time I moved, something sort of broke in my clothes.

This is the way we did things, and I'm sure that Dearborn, Littlepage and Pearse and those guys did the same thing. We all were self-reliant, and it really, I think, was a character building experience.

PETER: And you have a whole continuum of personal observation, because you were there in the 1960s and then in the 1970s and 1980s, and then recently in 2010. So you really got a sense of how it has changed.

PAUL: Things change. I see here in my notes that I had written down someplace else that I actually made it 150 feet along the shore when I fell in before I was able to get out. So that was a fair amount of thrashing around. I was nowhere near death. This whole business of dying so quickly is just a myth. I wasn't heroic. I got out and I realized that the practical thing to do was to finish the job because at that point I wasn't cold anymore with the ice on my clothes blocking the wind.

One of the other things was the problem with getting fresh water on the McMurdo base. The nuclear power plant was just going online, and it was mostly irrelevant to us. Eventually the nuclear power plant made fresh water, but in the early years, all the fresh water on the base came from snow. The Antarctic doesn't have that much snow really. So it was really hard, and in this case they were Navy guys that were no longer volunteers, and they didn't like their job. They had to go around with a front loader and get snow, and then they would trundle the snow back and put it into snow melters, which were big tubs with big fires underneath them, diesel blowtorches sort of. It melted the snow and made the water for the galley. There were three snow melters for the whole base. One was the galley, one for the biolab, and the other one was in the laundry, and when I wintered over, there were two showers for the entire base, even in the summer.

We couldn't have more than one shower a week, and most of us didn't do that because the water would be muddy from the dirty snow and things, and you knew it was a problem because they were still doing laundry and everything else in there. The Bio Lab had the other snow melter, and we needed fresh water. We had to get it for the work. The work was only Curly's and my work in there. So when I needed it I would phone, and the unhappy guy would go get it, but he hated civilians and he hated doing his job, he hated me, he hated everything. He would ram the front loader really hard into my snow melter, and it would shake the whole building, and things would fall off the shelves, and eventually he would break the snow melter.

Then the guys from the shop would have to come over and weld the snow melter. Finally I heard some of the shop guys threatening to break his neck if he did it again, so he stopped banging my building.

That was our source of water even into the 1960s. In the late 1960s when Gordy Robilliard and I went down to dive, fresh water was still a big deal although I think that they had some coming from Nooky Poo (the nuclear generating station that also distilled sea water). We were taking water out to warm ourselves up after a dive, we had to sneak it. It was not right for us to waste fresh water. That is something that people don't even think about anymore ... the trials of getting water from snow.

Okay, so more wintering over memories... The pilots that wintered over were wintering over unhappily. We had two helicopter pilots, and two R4D pilots... the R4D is the Navy version of a DC3 on skis. They had to winter over in case something happened at one of the other bases. We had the only doctor in the Antarctic. I think they were mostly worried about Byrd station up on the plateau or South Pole.

So they were wintering over for emergency evacuations, and they were just there. They were good enough guys, but they weren't the gung ho pilots from the summer. When it got light they actually flew, and as soon as it was light I took the helo across the valleys into Taylor Valley to change Tom Berg's batteries, for example and the R4D flew around the island to check out the Crozier hut that had blown away. So we had flying capability all winter. I don't remember exactly when it happened, but it was I think in June, right in the middle of the winter, the doctor, or maybe it was a medic, at Hallett Station burst his appendix, and he had to be medevaced.

Neither the helo pilots nor the R4D pilots had ever been out of the wardroom and their bunkhouse and the galley when it was dark. They did not know what it was like. To them it was Antarctica, it was dark, it was cold, if they went out and tried to fly a plane in the dark to Hallett, they would die, and they wouldn't do it. If I could get them out on the ice away from the base and the lights and their wardroom, I knew that they would see how easy it was. I could count the strata even without a moon on the other side of McMurdo Sound in the middle of the winter because there is that much ambient light just from the sky and all the reflection of ice and things. There is a heck of a lot of light. It's not pitch-dark when the weather is clear. You can see a long ways, and it is pretty easy to fly a plane. I tried to get them out, and I couldn't get them out. And so the guy up there, we all thought he was dying. There were a couple of Navy guys that ran the radio, which at that point was up on the top of the hill behind McMurdo. They didn't have a vehicle that would get them up the snowfield, and my polecat would. So he was my buddy and I would run him up there, and we would sit around and talk a little bit, and then I would come back and pick him up later.

During this time, I got the impression from the things he said that perhaps he shouldn't have told me is that the Navy had a nuclear submarine down there in position to rise up, break the ice at Hallett and rescue the

guy. However it was in violation of all of the Antarctic Treaty, so it was very, very hush-hush. I never really knew for sure, but he kept talking about the messages he got, it was all in some code about where something was, and that is what he guessed was going on.

The guy's situation at Hallett was all over the open radio traffic, and it was the worst of the Cold War, and the Soviets were listening in and even commenting on it. In fact, the Soviets were involved with us a lot. They played radio chess, moving chess pieces by radio, and they were playing chess with some of our men. I think that the submarine rescue was vetoed. And these pilots just wouldn't go up there. Apparently there is a way of getting into some sort of fetal position and taking huge amounts of antibiotics that your body will maybe seal off the poison from the burst appendix, and he survived. They hustled in when the fights started in the spring and got him. That was interesting.

Another memory from that era was the midwinter party -- Scott had a midwinter party, it means you are over the hump, the sun is going to come up, so everybody celebrates.

PETER: When is that held?

PAUL: On June 21, it's the solstice, so it's the middle of the winter. So McMurdo had a fairly big amount of partying. The enlisted men had their parties which were a little out of control. The officers just went to the wardroom and watched a movie and drank fairly heavily.

At this movie screening - held in the same place where you bought coffee, it's the same building, the bar is in the back and the movie screen was at the far end, and they had little chairs lined up for people to sit in. It was pretty full of people because it was a party and we had been drinking. Our good captain, the CO, Captain Riley, was in the back, and I think he had passed out. The R4D pilot was sort of sitting up near the front. Everybody smoked in those days, and he had this big pipe. He had a huge lighter, a veritable blowtorch to light his pipe. He is in the middle of lighting his damned pipe, ruining the picture with Kim Novak, whom I was really interested in seeing. When he lit up his pipe, it looked like a bonfire, it was a great big cigarette lighter, but it looked like a blowtorch from the back.

So I was sitting there trying to see around the blowtorch to admire Kim Novak. Suddenly there was "Fire, fire!" from behind me. It wasn't very loud, and I don't think anybody looked because the movie was pretty loud, and they were all sort of drunk. I looked around, and it's bloody Captain Riley. He'd come to, seen the blowtorch up in front, and by the time I'd looked he had already turned over the acid soda fire extinguisher, which is sulfuric acid and some sort of soda, and it reacts and sulfuric acid and soda come squirting out. And the damn thing was starting to go! He was thrashing around squirting stuff all over, the R4D pilot was up there with his pipe getting lit. I saw this happening, and I dove under the chair so I didn't get any of the sulfuric acid. The CO sprayed the

officers with sulfuric acid, and he sort of hosed down the R4D pilot who stood up all angry, and everybody else was yelling and screaming. The enlisted bartender was trying to control the extinguisher, "Sir, may I please take that? Sir?" "No, fire, fire!" And I'm under the chair, and there was all this bitching and moaning above me. Finally, the bartender got the fire extinguisher and was spraying it into a corner someplace, but the damage was done. I pulled myself out from under the chair carefully so I didn't get too much on my shirt.

At that point, the captain was now aware of what he had done. He was all apologetic. The R4D pilot stood up, a tall guy, and his shirt was just dissolving as he turned around, it was falling off his chest. And the captain was, "Oh, I'm so sorry."

"Oh, it doesn't matter, Sir, think nothing of it, Sir, these things happen, Sir." It was hilarious. So I went back to my room eventually, left those guys to clean up the wardroom.

Something else was happening at the same time with the enlisted men in the firehouse. The chief of the firehouse got really drunk, and he was up on the place where they slept. They had a pipe, because all firemen go down pipes, it is part of the tradition. It does get you down pretty fast. So there was a pipe and a nice little landing place, and the firemen, if there was a fire, would slither down the pipe and go out and fight the fire.

The chief of the firehouse was just blind drunk, and he showed somebody how to go down the pipe and he missed it by about five feet and took a header onto the floor and broke his neck and scalped himself.

Fortunately, the doctor who had been in the wardroom wasn't drinking because he was a doctor and very responsible -- I think he and the dentist anticipated some adventures that night -- so I knew they were sober. They kept the guy alive, but I think his brain was probably permanently addled, because his skull was broken and things. Then there was the issue of getting him out. Meanwhile, the poor doctor up in Hallett who was in his vegetable state and not coming out, they organized a midwinter flight of a 130 to come down and get this guy. That took about five days, and it was a huge big deal for us at McMurdo. It was a mail opportunity, for one thing.

At that point, the helo pilot was quite willing to fly his helicopter out to the strip. When they brought a plane in, there was a lot of concern because you get past the point of no return, and our weather forecasting's were not good, we didn't know what was going on. So people were pretty nervous. We didn't know what was going to go on, so everybody that had a vehicle was down there to help in case it crashed. We often did go down there when there were airplane problems because there was no way of moving people around if they were injured except for our various vehicles on the base. For this event, they had spent four or five days plowing the strip, and the strip was in good shape at that point. They put big 55 gallon

drums with diesel on fire to light the runway. We were all there, and it was pretty remarkable to see the little blinking lights of the airplane come out of the night where you thought you were stuck forever.

PETER: And the runway is all lit up with fires like luminarias.

PAUL: Yes, with fires and the smoke and all of that, ... it was pretty smoky too. We were all lined up with our vehicle headlights on the runway for him too. It must've been pretty interesting from the pilot's perspective. It was really exciting for us because we really thought we were there for the duration, and suddenly we weren't... you can bring a plane in. They had filled up the 130 with several huge fuel tanks in case, so that the point of no return was much longer. And it made just a really perfect landing. It was about -30, it wasn't one of those -70s, but it was -30 or so, it was pretty cold.

PETER: And they brought in mail?

PAUL: They brought in mail.

PETER: Did they bring in anything else like fresh produce?

PAUL: Yes, they did, they brought in fresh produce for us too, which was a huge big deal. But at any rate, there were all sort of things that happened in 1964.

PETER: Did you go to the enlisted men's bar?

PAUL: Not very often. It was really drunk and pretty obnoxious, and they weren't friendly. The chiefs were very businesslike, they drank more professionally. And the officers in the military have a wardroom posture of being stiff and upright, with their chest out and their shoulders back, looking really macho.

PETER: How many scientists were there over the winter?

PAUL: We had five. There was the cosmos guy, Evan Deardorff, there was another physicist that was listening to ionic noise, Ernie Svata or something - he mostly stayed in his lab on the ridge and rarely came down. Kelly Rennell, who wintered to look at insects in the winter and was always very helpful to me. Then John McDonald and me. That was it. But then there was a lab manager, Ken Brown, who never came to the lab. He was a civilian, but he spent all of his time with the enlisted guys.

Then there was Graeme Johnson, who in my mind is probably the MVP of the early American Antarctic Research program. He was a Kiwi. He'd wintered over in IGY at Scott Base, and he was a mechanic and retired kiwi air force, and he could do anything. He was as solid as a rock. I still think of him as one of the most important players I've encountered.

The food was really awful. We were eating dehydrated stuff from the Korean War. The dried eggs, for example, were like plastic, you could wad them up and bounce them. The food was really bad in the winter.

Other memories of a different era I offer as an idealistic left-wing liberal of a sort. It really hit me hard when Kennedy was assassinated. All the communication at McMurdo was on teletype. There were these little terse teletypes that he'd been shot, and then he was in the hospital, and then he was dead. Johnson, who I never really particularly thought much about, was now president. So this to me was sort of a staggering event.

I can't remember the dates of when the Bay of Pigs or the Cuban missile crisis happened, but they were just before my visit to the ice and set the stage for an acute sensitivity about such political things that went on that made me very nervous that year. You are down there, you are stuck, and there's not much you can do about it. When JFK was shot, I still remember that really vividly.

Then during our winter over, it was Johnson's run for president against Goldwater. I knew Goldwater well because he was from Arizona. Goldwater was very much into war and being tough, and Johnson was just basically a really slick politician that I didn't know much about him.

The politicking had a lot to do with preemptive strikes on Russia and things like that. At least that was the type of thing that dribbled in on the teletype machine. What I actually came to learn was that it was Johnson scaring the people, Goldwater wasn't actually proposing to do that, but this is what we were getting on the ice. So I'm down in Antarctica thinking Jesus, am I going to come home to a nuclear winter? You know, this is scary stuff and here I am stuck there. So these were things that were big for me then.

The Kiwis at Scott Base -- Scott Base was much the same as now. The Kiwis were very independent and they were very friendly. Any time we would go over there they would break out something to eat and drink.

PETER: Were you allowed over there only on certain evenings?

PAUL: No, whenever we wanted... nobody paid any attention to us. I was busy and did not go often, but it was always warm and inviting.

PETER: So it is different than now, now it is much more controlled.

PAUL: It was very different. Well, there was nobody to visit them except for maybe 150 people at McMurdo and seven of us civilians. The military people didn't go over very much, hardly at all. The Kiwis had dogs I liked to visit and enjoyed loving the huskies. We had two dogs, also, now that I think about it.

PETER: Sled dogs?

PAUL: Yes, and a couple puppies got loose and came to McMurdo where they became pets. We had a dog in the Bio Lab much of that year. It was a really nice husky.

PETER: They didn't want him back for a sled dog?

PAUL: No, they knew where he was, and they had had puppies, they knew he was there. They never used the dogs, the dogs were for PR. They killed 50 to 55 seals a year to feed the dogs who were just there for when a camera crew came out, some Kiwis would come out and drive around in a dogsled.

PETER: So they weren't actually working dogs?

PAUL: Yes and no, they were trained sled dogs and taken out and run, but they weren't really needed for anything. It was tradition, and there were a lot of seals going down. At the time it didn't bother me that much because we used seal bait for fishing, and it was a different era, I had grown up in hunting traditions. I killed a seal and I feel badly about it now, obviously, but at the time I came from a tradition of hunting and it did not have the moral impact that it would now. Anyway, the Kiwis were fun. At the time there were no bowling alleys in New Zealand, I don't think. Some of Kiwis just loved bowling; McMurdo had a bowling alley that they put up in the winter. So we had a bowling alley, and those Kiwi guys were the main people to use it. It was maybe four of them, but they just loved it. They went home after they wintered over at Scott base and set up a bowling alley in Auckland and got rich. I don't know if that's true or not, but that was the mythology, and I want to believe it.

PETER: Were there any scientists at the Kiwi base?

PAUL: Not in the winter that I remember. The scientists were mostly geologists, so it was still the era of exploration. In the summer they had really good scientific programs with penguins and seals and wonderful dry valley projects. They had excellent penguin and skua programs from the beginning and early on they had a wonderful shipboard marine biology program with effective drop cameras and grabs.

PETER: Did you interact with the biologists?

PAUL: Oh, yeah. We knew each other.

PETER: Just socially, not with research?

PAUL: In that article I mentioned ["Antarctic Memories of an Old American" in US Antarctic Research Program Oral Histories. Scripps Institution of Oceanography Archives collection 2012-14], that I wrote for the Kiwis, any time there was a trip to the dry valleys, I went along. There was one Kiwi trip I tagged along on to Taylor Valley right at the head of Lake Bonnie where there was a glacier with this red splotch, the blood glacier we called it then [now called Blood Falls on the Taylor

Glacier, with its red coloring due to iron oxides]. The glacier has now melted way the hell back, but the glacier was much closer then, but the iron was still bleeding out just like it is now. So that was something that we were interested in.

John Pearse was talking about the discovery of the dry valley lakes being warm at the bottom. That was by an American, Ken Armitage, that discovered that, and he thought it was geothermal. We knew that the lakes were warm, and we actually knew that they had a biological layer in there, so that was known from Armitage's early pioneering work - but the mechanisms were not understood.

I got dropped off with a kiwi graduate student who was working with a geophysicist named Alex Wilson. They had a nice little hut that was up at the head of the lake about maybe a mile or two or so, it was a walk but not a bad walk from where we got dropped off. We were going to get dropped off and we would have many hours, and there was going to be a pickup of me at the hut. So the Kiwi guy and I got the samples of the iron from the blood glacier to take back to Alex Wilson who understood exactly where it was coming from, as it turned out.

We were walking back and we discovered to our delight an old (remember in 1963 old meant 3-5 years or so) IGY cache. During the early IGY years the transportation was not very reliable and they prepared to spend extra time in an emergency. So all over the dry valleys they were caches of food, big boxes of Bolton rations and fuel. And, as it turned out when we got into it, there was a bottle of whiskey and a box of Cadburys. So the student and I knew what to do with those, we left the other stuff behind, but we freed the whiskey and Cadburys.

So we were drinking and eating on the way back, and when we got there we shared our largess with Alex Wilson and his small group of people. I got talking to Alex Wilson, and he was really one of the brighter scientists I've ever met. He knew just intuitively what the red was in the glacier, but he also had figured out how the water was heated. Not from the geothermal, which he said was nonsense, which had to be nonsense if you thought about it, but he figured out how the salinity stratification would trap the heat, and that there would be a warm spot in the middle. He had it figured out, and he was there testing it and putting down his thermistors and things. He was making the thermistors in the field, and he was making his oxygen sensors in the field.

I was doing Winkler titrations at the time, measuring oxygen the old-fashioned way. Alex was sitting there with his little pieces of rubber and latex and fabricating oxygen sensors. And it was just in that hour or three when we drank whiskey and ate the Cadburys he explained to me things that took years for people to figure out on the lakes. He explained how the glaciers would surge because they were melted at the bottom, and that there were probably lakes under the glaciers, which took us decades to find. He understood glacier surging. The guy was sort of a universal

genius. You asked me about the Kiwis and the Kiwi scientists, and that's one of my good memories.

The Kiwi's had really good bird and seal people. Ian Sterling became a really good friend; he was working on the seals. There was a seal guy there when we wintered over. Murray Smith was branding them with blowtorches. His brands festered in those seals for years and years, they were just a terrible thing to do. When Ian came down in 1967 or 1968, he knew how to handle seals. He had been working on grizzly bears, and now he was down there. He is still working on polar bears in Alaska, in the Canadian Arctic. He is another one of these universal geniuses I so admire. Ian knew how to work with these animals, you just put their heads in a bag and then you can tag them or do anything you want with them. They stop thrashing around when their heads are thrust into a black bag.

Gordy and I have really strong memories of when we met Ian. I think we talked about the awful BBC crew that deliberately left the door open in a very cold hut to start with and we almost froze when we came up. Well, a few days after that we met Ian. We vividly remember coming out of the water and sitting there by the Preway. We had just dressed in the cold before we got the tubs and the door crashed open and we both immediately started to lose our temper thinking it was the BBC assholes coming back, but no, hark, there stood a complete stranger with hoar frost all over his clothes and ice around his face standing there with a tiny 4 wheeled "Bug" going putt putt putt behind him in the wind and cold. Gordy got it together faster than I did and yelled politely to get his damned ass inside and shut the door. I fear it may have even been a bit stronger than that. Ian did, and immediately wanted to know what we were doing, listened respectfully, understood everything (the first time anybody had appreciated the project) and asked good questions. He told us about his seal project, and Ian Stirling has been one of my great heroes and best friends ever since! I had blamed him for Murray Smiths brutal tags but Ian disillusioned me of that immediately and explained his tagging operation. Clearly he was the best in the business, even as a graduate student. He would drop in on us fairly often and talk, and we would share a lot. The relationships were good.

Back to the kiwi science relationships, I don't know how they are now. When I was there in 2010, I didn't run into many Kiwis but they seemed as friendly and competent as always and I have some really good friends at NIWA in NZ who do excellent Antarctic research, so I have nothing but huge respect for their science.

Anyway, let me go on back -- there are some things that I thought of that we didn't talk about with Gordy Robilliard. One was the scuba regulators. I'm pretty sure they had bought a bunch of regulators in maybe 1962 for Carlton Ray's program and Gerald Kooyman's program. In the early 1960s, most of the regulators on the market were two hose regulators. That was sort of what we used. When we got there in 1967, I knew the regulators were there from helping Jerry et al. They had a couple of shelves of

regulators, there were probably maybe six or seven regulators, maybe more. All two hose regulators, and they all worked really well. But they didn't have a compressor that worked very well, and so that was a problem.

I think James Stewart got involved at McMurdo in 1968, but after we had left. In 1967 Gordy and I had to go to Key West and have our diving checked out by the Navy. In 1968 we brought Chuck Galt down to dive with us, and I think he was the first Antarctic diver to be checked out by Jimmy. So in the summer of 1968, Chuck Galt was here at Scripps getting checked out by Jim Stewart. We went down, and the compressor was just shot. They hadn't done any of the things we told them to do, but instead put a bunch of filters on the old worn out one that blew out the system immediately. So we had compressor nightmares.

At this point McMurdo Station was shifting over to civilian contractors. They had hired two mechanics, and a guy who was in charge of maybe the food locker and the dive locker. The food locker was basically where you went and got pots and pans and tents and sleeping bags for your field trips. It was just open shelves, you go get what you wanted. It wasn't a big deal. So the new guy lorded over the diving locker and was obnoxious about it being his not ours, and we used it only with his permission. I think Jim went down maybe after we left McMurdo, and I think it may have been 1969. So we left at Christmas in 1968, and I think he came down immediately thereafter or shortly after. I didn't know him personally; I met him later, when I first came to Scripps.

PETER: Did you know there was a diving officer coming or something at the time?

PAUL: No, basically we were on our own. He came down to fix the compressor because we had made so much noise about it. The NSF had decided, or the Navy had decided, not to send civilians to Key West! I suspect that Gordy and I did not make friends for the NSF with the Navy at Key West. So the NSF had to have somebody check out the divers. And who else but Stewart?

PETER: So you were the last USN-checked out divers in the US Antarctic Program, because then Jimmy Stewart started certifying them?

PAUL: Well, he checked out Galt. He was very reasonable. Jim is one of my real all time heroes. There was none of this macho stuff. Are you comfortable in the water? Are you strong, strong enough to get to the surface? Take care of your buddy? Okay.

PETER: Did Galt have to report on his dives to Jimmy, a dive log or anything? Was it only an initial checkout?

PAUL: No, there was just a checkout. There was no more control at that time.

PETER: Again, very different from today.

PAUL: Very, very different. You remember how Gordy and I discovered repetitive dive tables. We didn't even know about them. To this day I haven't had a formal diving course, so it was a different world. The two hose regulators worked pretty well, and I am actually quite proud of the diving program that Gordy and I put together. We got a lot done. And while we worked deep, we were very careful and I think very safe once we figured out the tables!

But in 1968 we were starting to have problems already with the civilian contractors. And we had problems with the diving locker. My personal log [in Paul Dayton Papers, Scripps Institution of Oceanography Archives collection 2011-83] is my rendition of what happened every day in 1968. For some reason I kept good records that year, normally I'm a very bad note taker, but 1968 was well recorded. I was just looking at October 2, 1968, I just stumbled on it yesterday. And there is a discussion of how the two mechanics and the dive locker guy went bad overnight. They had been quite friendly to Gordy and me, and then I was in the garage working on the Homelite saw, and things were okay, fairly cool. And then the next day I came in to finish as we needed the saw, and they all looked at me and they started whispering. They were aggressively hostile. It was an overnight shift that had to come from above, of people putting down the scientists. So there was overt, nasty hostility to the scientists from the contractors and it happened on that date for these guys.

At that point, the good NSF saints in the early 1960s, had left and been replaced by people more interested in developing a dependent relationship with contractors. I wasn't very much aware of what was going on when I wintered over because I was doing my own thing getting my work pretty much unfettered by anybody. The NSF had three I think really remarkable people, Phil Smith, William T. Austin and John R. Twiss. They were young, they were probably in their early to mid-twenties at the oldest, and very very capable. They were in charge of taking the research program away from the Admiral. Admirals aren't used to having young civilians tell them what to do. Those guys in hindsight -- and I got to know Twiss very well over the years, I know for sure that they had a lot of trouble forcing the Navy to do what they asked instead of letting the Navy boss us around. So those guys were quite heroic. I think in 1967, the NSF was starting to bring in civilian contractors because they were having so much trouble with the Navy guys. I remember being in the chalet, the NSF office where there was a civilian who I remembered being passed over by the Navy as a C-130 pilot, now a civilian working for a contractor. I remembered him from before as hostile and cold. He was lining up with a private contractor to take over the Navy's job. This is when the contractors were starting to come in. He was standing in there with his wardroom posture and alpha behavior. I remember it really well, with the shoulders back as though to say: I'm really a super stud and I know everything, telling at that point some NSF guys how to deal with scientists. "These guys, you have to get control of these guys, they are out of control. They have to be closely supervised because they are

incompetent and they are going to get you in trouble. It is just a matter of time" It was really gross.

PETER: Did he know you were standing there?

PAUL: I was standing there.

PETER: He was saying that, knowing there were scientists there?

PAUL: He didn't care, he just didn't care. I was still a student, this was 1967 or '68, and I was pretty young myself. So he was saying that, and the next year we ran into this buzz saw that just happened overnight. And I'm pretty sure that Holmes and Narver Services, or whoever the first civilian contractor was that took it over, basically got their guys together and said anti-scientist hostile things on October 2-- I imagine this passed over turkey or somebody just like him was in charge, and he probably give them that same story. Those guys changed overnight, they were really okay, I was in there doing some different things with them, and they were fine, and the dive guy wasn't a problem. Then when I came in the next day it was totally different; they glared at me and whispered and walked away from me. Then the dive guy became a problem. He was spiteful and hateful, and the mechanics were just awful.

The day before I had set aside a small Homelite generator we had used for Doug DeMaster, that when you take something out of the shop to go into the field, you check it out to make sure it works. I had been using it and taking it back. I was just using it when I needed a generator.

Doug DeMaster, who was going out to work on seals, had needed a generator. So I set it aside for Doug and told him it worked fine. The next day when they became hateful, there was Doug's generator sitting there when it should have been out with him, and they were all numbered so I knew what it was. The chief mechanic was telling the other mechanic -- both of them were sort of bozos -- that this was the only generator in the shop that worked, and we can't let a scientist have it. So they had switched it out.

And while I was there, Doug came back all angry because his whole thing had been ruined, with a generator that wouldn't start, and the guy just sort of smirked.

Meanwhile, they were working on one of those big generators, and it was a great big thing on skids. They had it undone, and the chief mechanic kept telling the other mechanic that all tune-ups start with the spark plugs. "Gotta find the spark plugs and check them out. Where the hell are the spark plugs." The whole time I was in there working on my saw, he was looking for his spark plugs when he wasn't abusing us or fighting with Doug. The generator was a diesel.

PETER: With no spark plugs...

PAUL: No spark plugs, and I knew that. He had been such an asshole that I wasn't telling him. It just got worse. Much worse. In the mid-1970s there was a guy in charge of the diving locker named Steve LaSorsa or something like that. He had an awful attitude problem. I don't think he knew anything about diving himself, all he knew was that all the equipment in the dive locker was his and his main job was to control us from using his equipment. He had messed up our regulators so that they free flowed a lot but with the two hose regulators it was behind your head and you did not know (we did not have sea view gauges then) and suddenly you would find yourself completely out of air. You can buddy breath with a two hose regulator but it is a chore and since this free flowing happened so often, we made up pony bottles that we always carried with a strap on an arm (obviously this did not help us do our work). We took care of our Pony bottles - they too had two hose regulators and you had to turn them on underwater, but we got really good at turning on the pony and aborting our work. Mostly we used them to decompress after the air leaked out of the primary tanks.

And it was not always just a leak. One time my first stage went out on the bottom on a deep dive and it just exploded air around my head taking my mask off with it! I caught my mask and got it back on and cleared and saw Oliver and Jim Barry rushing to help but I got the pony going and we all went up. But LaSorsa would not let us work on our regulators, they were HIS regulators and he was the only one to work on them! He locked up all the tools in the locker and even locked up everything else including the weights and he was never around to help but made our work really difficult if not dangerous. Oliver and I took pictures of the locker with everything locked up and they are in the library archives if you want a good giggle.

By the 1980s there was a new dive locker that was wonderful. It even had a shower and the locker folks filled our tanks for us and always did everything they could to help, so early-on the dive locker situation recovered from people like LaSorsa to the best dive support operation I have ever heard of. I can't remember the names of the early dive locker guys in the 1980s, one was an experienced cave diver, but they really knew their stuff and were wonderful. Eventually Rob Robbins and Jim Maestro were there and were just superb. Rob is still in that job and Jim wrote an introduction to Norb Wu's book that is the best natural history summary of Antarctic marine biology I have ever seen. It is simply hard to really believe how wonderful Rob and Steve are!

PETER: but in general the contractors were not very helpful to the scientists then?

PAUL: Well, the civilian contractor got more and more hostile to the scientists, and there wasn't any thought of service. You were still on your own, but if we needed equipment, it was a nightmare of groveling.

That's when I first heard the term "beaker" used as an insult. Beaker is now just sort of laughingly a scientist, they work with beakers very well

now, but at that time it was an insult to make sure that all the contractors realized that beakers were hapless heads-in-the-clouds academics utterly incompetent to take care of themselves. Jim Barry was there in 1970 or so and he thinks that the terms started with the Navy, and he is probably right.

PETER: When you were there in 2010 were they still using the term beaker for scientist?

PAUL: Oh, yeah, it's still used. It was there for you too, I'm sure.

PETER: I heard it in 1997 and 1999.

PAUL: It started in the late 1960s, and it was an insult. It was a put down ... you stupid beakers, you don't know anything. I don't think it is an insult now because the contractors who work with the beakers are really great and helpful.

PETER: The term beaker for a scientist got started when the civilian contractor started running McMurdo, not the Navy?

PAUL: I thought so, but Jim thinks it was the Navy, when people like the passed-over Herc pilot exerted those ideas on how to control scientists, and of course how to have cost-plus contracting and get more and more people down there paid by the government contract to take care of the poor stupid beakers before they kill themselves. To be fair, there were hapless scientists who did need to be babied.

But my memories of the 1970s and 1980s, are full of these tensions with the contractors. The NSF people in those years often (not always) seemed in cahoots with the contractors. Sometimes they would see me in Washington DC later when I was on the Polar Research Board or something, and they'd be my good old buddies, but often they weren't helping us in the field.

There was one exception. My memories of David Bresnahan are universally respectful. Dave did a professional job. He helped us whenever he could, and we were hard to help because my scientific appetite is bigger than what can be supported, so I am always pushing the limits of what I can actually do in the field. I needed logistic support, and I was a difficult scientist. I was probably obnoxious to the contractors because I was self-sufficient and demanding, so they would probably offer the same memory of me. One example when we were working at Salmon Bay. Blasting through 25 feet of very rotten ice was really difficult and needed some much powder that we would drag it over on snow machines and sleds and even then cleaning the holes was awful. I had the insane idea of driving the drill rig over to our site and letting it winter over with the idea that we would use it to drill our holes on a winfly and get it back to McMurdo in the early spring when the ice was smoother and easier to drive across. For many reasons the idea was insane and I realized all the problems with it when we were working over there and returned to find Dave actually trying to make it work even though he saw all the problems. In principle

it could work but clearly it was a stupid idea yet he was really trying. I have never forgotten that event of people truly trying to support science.

If I could get a problem to Dave Bresnahan, and if he was on the ice [meaning resident at McMurdo Station], he would be helpful and do what he could and if he could not, he looked me in the eye and said so and I understood. Bresnahan was diving in Antarctica before we were diving there, about 1966 with Jacques Zaneveld. That picture of the Nodwell going through the sea ice crack, Bresnahan was in it in 1967 I think, when the Nodwell went into a crack, and Jacques Zaneveld leapt out and broke his leg. So Dave goes back quite a long ways with me, and I respect him. But otherwise, the relationship and respect for the scientists -- I don't know about the 1990s -- but in the 1970s and the 1980s, became pretty bad.

Let me just run through my memories a little bit of the NSF hierarchy as I probably misunderstand it. The first person that set up the Antarctic program was a guy named Tom Jones. He had a scientific advisor named Bert Crary, who the Crary Lab is named after. These were really good guys, real leaders. George Llano was the biological program manager, and he was a real visionary. He was one of the all-time heroes in my life, because he saw the future really well in terms of science. He always encouraged me to push the envelope. A good biologist doesn't stick to a plan, they grow as they see better things to do. I did not know Jones, but Crary especially had a huge amount of field experience and very much understood field science. Llano also had field experience, but his own field was with lichens I believe, but he was a dream science manager because he knew what was involved and went out of his way to help the scientists he was supporting. He also went out of his way to find and encourage and importantly, to mentor, young scientists.

PETER: He was encouraging you to write proposals?

PAUL: Write proposals, he helped me to write my first proposal. You know, when I wanted to set up a program at New Harbor -- nobody ever thought one could dive over there -- he was fine, he encouraged me.

PETER: Because before that, people worked in a certain radius from McMurdo Station?

PAUL: People always went into the field, but our diving program in the 1960s was near Ross Island. The farthest west we got was an abortive dive at the Daily Islands. But we did get to Cape Bird and all along the Ross Island. But it never occurred to me to completely cross the Sound.

PETER: Right, and then you went across the McMurdo Sound. You were the first to go diving over there across the Sound, and that's because you wanted to compare the ecology over there because of the water currents?

PAUL: That's right, that was in '74. John Oliver, who was my student at the time, had been talking to his roommate. There was a deep-sea dry

valley drilling project at New Harbor, and the pipe is still there in the sand. John and I were rooming with the scientists involved with the drilling, and they were telling us about the ice being eight feet thick. I didn't see why you couldn't dive there -- because I was blasting holes all over the place of the 1960s, ... eight feet, 10 feet, 20 feet. Just enough dynamite, I'll get there. Anyway, as soon as John came in, he said we ought to go look at that, so we did. It was his idea but it took me about a second to jump at it!

PETER: And Llano supported it?

PAUL: Oh, yeah, Llano supported it. You couldn't do that now. Now it's turned into the NSF routine that you really sort of have to have done the research to be able to get the grant and you have to have absolutely precise plans before you go down and it is hard to make changes in the field because the system resists it. The system does not understand how critically important the exploration phase of science can be to really understanding an ecosystem.

PETER: To just go someplace and set up a field camp to do diving research, that would be a huge undertaking now.

PAUL: Yes, but at that time they would fly us in, and they would leave us for 10 hours, 12, 15 hours. We would set up the Scott tents. Gordy and I were doing this in 1960s, we were doing day trips all over the place. We went to Cape Byrd, we went to the Dailey Islands, we went all over the place in the 1960s. I just hadn't gotten to the other side of the Sound.

PETER: So when did they build the building at New Harbor?

PAUL: That was actually Ted E. DeLaca who built that, I think in the late 1970s. We were just working out of our Scott tents on the ice. And then in the late 1970s, Ted DeLaca, was a foraminifera guy, and the foraminiferans are really interesting. Ted also was politically well-connected, and I think Oliver actually took him by hand and showed him arborescent foraminiferans, which are deep-sea foraminiferans, and Oliver recognized that. In any case, DeLaca saw the opportunity and was excited as hell. He's a good scientist, he was very excited, and he built the building.

PETER: Now it's a permanent field station.

PAUL: Well, once they put the Jamesway in, they never took them down. But it was just one Jamesway, it sort of grew. It grew with DeLaca's program, and DeLaca's program has continued through Sam Bowser, who has been running it for 20 or 30 years or something, but that was DeLaca's original program. I think Ted was a post doc from UC Davis in Hessler's lab at Scripps when he started that program.

PETER: Right, then he went on to Alaska?

PAUL: Yes. We were friends, and we helped each other. He was a good guy.

PETER: So you guys told him about the foraminiferans there, and that got his whole research interest going.

PAUL: Yes, at least I think it was from Oliver, not me, but that was after Llano encouraged us to push the envelope, and Oliver suggesting it to me. That opened up New Harbor -- I think it is still one of the most interesting areas in the world for benthic ecology.

PETER: Because of being able to work on both sides of the McMurdo Sound?

PAUL: Because it's so different, it's so very different. And it's like my first dive that summer in 1974, I had been arguing with Howard Sanders at Woods Hole on deep-sea diversity. I really wanted to go into a submersible and see the deep-sea diversity that I had just seen from pictures. It was a big thing on my mind in 1974. I made that dive, it was darker than hell. I went down, and as my eyes focused it was one of the most exciting moments in my career. It was deep, we didn't know how deep it was, and we put the hole in, and it was 150, 160 feet. But it was just ophiuroids in mud as though I had swum out of a 4,000 Alvin dive.

PETER: Not much hard substrate?

PAUL: No, it was all mud at that site, and it was one of those big moments in your life where you just sort of stop and your heart is thumping as you really get a grasp of what you are actually looking at. It was really, really exciting for me. I was shivering but this time not from being cold! So that is how we got over there, but it was Llano that made it possible by encouraging me to push the envelope. He really deserves praise, and he doesn't get very much because he was just helping his biologists, not pushing his own career, and he was a very decent and wonderful program manager. Again, I point out that Dave Bresnehan was also always very helpful with our logistics working on the other side of the sound and was very supportive with what was a logistical nightmare from his perspective. I don't think we would have been successful over there if Dave had not been involved.

But back to the early NSF, at the top, Tom Jones and Bert Crary, were real legends, even by probably 1961 or 1960, there was a Jones mountain range.

PETER: They were in charge of the whole scientific program?

PAUL: Yes, the Antarctic in the early days was mostly geology, and it was field mapping geology. It had really good field geologists. Those were geologists of the 1960s, 1962, 1963, that had been there since IGY, they were really good. They were all older, they were probably in their late fifties when I met them in the 1960s. They had grown up in Alaska and Greenland. They were good, very good, and very self-capable and competent field people.

One of them in particular, after Jones retired, was Bob Rudford. I think he may have moved into the division director, Jones' position at the very top. He was also in my mind, one of these sort of heroic figures because he was so competent and decent. I think he had lettered in a couple of sports for several years at the University of Minnesota. I think he was a football player. Tall, athletic, strong guy. Really good field man when I met him in 1963. He'd already been working on the Jones range, named after Tom Jones, I think. And in 1963 and 1964 he had his own program; he was a young guy then running a big program.

I have these memories of him in that the old field Butler building, that shop where we all did everything. He was in there building boxes for his collections, so he had all these flats of plywood, and that's what he went down with. Flats of plywood and nails and tacks, and he went down expecting to go in there and build his boxes. I'm in there trying to fix my equipment, and he's over there bang-bang-bang, running this plywood through the saw and making boxes and smoking a pipe. I have this mental picture of it, just a tremendous, self-assured, competent and very nice and decent man.

Eventually, I think maybe from 1972 or something to -- I'm not sure when he became director of polar programs, but he was director until maybe 1977. I don't know why he left. I think he went off to become a university president in Texas. So I think it was a promotion for him but I sure wish he had stayed with Polar Programs.

That was really the beginning of the end. That would have been in 1977, and he was replaced by a guy named Ed Todd. From my perspective Ed Todd was a disaster. It was a lateral promotion getting him out of some NOAA job I think. I remember we all worried about it when it happened in the late 1970s.

PETER: You wanted to continue with your research endeavors and interests, and so director turnover is a huge concern.

PAUL: Well, Llano was my biology program manager in the early 1970s. There was a guy named Andrews and maybe another. Then we had Dick Williams who was a very nice and decent man, so my program was okay and the biology managers were fair and very nice. But Ed Todd was at the top. This guy's attitude inspires the contractor. So he's the very top, he's the big honcho, and when that was Rudford, it was really good. Then it became Todd, and seemed unhappy in his job, and he would stand around at the orientation meetings where he had to meet us and talk to us, and give us little bits of dry bureaucratese about who was in charge here. Todd was genuinely uncomfortable and often embarrassed around scientists.

We used to be USARP, US Antarctic Research Program. I think he's the one that got so tired of the scientists that he took the research out and made it USAP, it was just a program, we are only here to maintain a presence for a possible land claim. He acted as though the science is irrelevant

to the mission, "my mission is to have a big base. And the less that scientists interfere with my mission of running a big base and having a U.S. presence in the Antarctic, the better."

Then Todd retired, and the job was taken over by somebody remarkably even worse, a guy named Peter Wilkniss. He was a grotesque leader. He really didn't like anybody, and I think he caused a lot of tensions in SCAR, I think tensions that might still be around, although I think we have far outgrown the Wilkniss era.

PETER: SCAR, meaning?

PAUL: The Scientific Committee on Antarctic Research. It's an international part of the treaty, and it's very important, it still is very important, and it is scientific. The Brits have always had a really good program, and Wilkniss really didn't like them. This came across in the polar research board meetings and his memos. We were maintaining a presence, these guys were competitors for our presence in the Antarctic, and that's all Wilkniss cared about too.

So while this was going on, of course contractors were taking advantage of it, and marginalizing the scientists very effectively with all sorts of control things. So if I wanted to get some more food or silverware or something, I had to write memos and attempt to justify trivial requests all the time.

The radio control thing got going too, where field parties had to report in every morning. That's a very reasonable ideal and it's intelligent, except that the radios didn't work. So I was constantly in trouble because I went to areas that didn't have good radio reception. We'd sit there, "Mac Central, Mac Central, this is A001," and silence. Buzz, buzz, buzz. It was just the way of life. Then they wouldn't hear from us, and they would come over in a helicopter and rescue us. The helo crews were Navy through the 1980s, and now the pilots had no interest in the science or even the Antarctic. They had passed-over pilots, who with few exceptions, were hostile. There were some exceptions, but maybe one or two. Overall they were always hostile. They had discovered that there are all these commercial rules for flying hazardous material which could even be a specimen.

PETER: A scuba tank, for example?

PAUL: It seemed as though it were almost everything including specimens preserved in alcohol. So in the 1960s and 1970s that wasn't much of a problem although it was getting to be difficult in the late 1970s. In the 1980s it became a huge problem because they made us adhere to every single little rule that we would have in San Diego flying on a commercial flight. So if I wanted to take a cigarette lighter to light my stove, I had to have it professionally packed by a professional hazmat packer who packed my cigarette lighter in a good-sized box full of Styrofoam and of course paperwork taped on and for the dumbest little items, even our pocket

knives if we declared them, had to be professionally wrapped by a hazmat packer. So of course there was a lot of cardboard and Styrofoam, which would then sometimes blow around because it was hard to keep track of it in the wind when you had to open so many boxes and packing just to get the gear you needed. So we were generating all of this packing, simply to haul routine gear around. We used to photograph the arrival of big boxes and all the packing to get to a box of matches.

The pilots then were all over it and most were really hostile and aggressive. In the 1980s there were sort of two levels of pilots. There were these older hostile, aggressive, passed-over pilots, and then there were these young guys immediately out of school. The young guys were ok, but very much influenced by the bad attitudes of the hostile superior officers. And they did not like to fly and were afraid. We had to spend a lot of time in the hangers waiting for them, and we could see how many hours they had flown because their hours were all there on the little clipboards, and we were always waiting because they didn't want to fly. These were pilots that were flying with 200, 240 hours. I almost had that many hours as a passenger on their planes, so they were very inexperienced. It is sort of scary to think that people like this did not succeed in the military and are now flying us around on commercial planes.

Instead of trying to get the flight skins -- the money for flying which the Navy pays you -- and flight experience and going out and seeing this gorgeous country like pilots did earlier, these guys didn't want to fly. They were afraid to fly. If you hit a little bit of wind and the plane jiggled some, the radio would be, "What's that, what's that? Everything okay?" The crewmen, who was usually a more professional, experienced guy, would say "Everything is fine, Sir." The landing was just an adventure. They go down inch by inch. "How are we?" "Yes, Sir. Still got five feet, sir." You know, that kind of radio chatter with these inexperienced guys. They were not comfortable in the air.

So if a pilot doesn't want to fly, he can find all sorts of reasons to ground the flight. This really hurt us as we would have blocked part of the time, the day had been sent aside, the weather was good, I could have been doing something at McMurdo but we were finally going to get out, and these guys would find something missing on the plane, and they would ground the flight. It happened over and over again.

That contrasts then with these old bitter guys. The bitter guys were causing a lot of trouble because they didn't like us either, so they would come back and just tell lies to the NSF about "dangerous conditions in their field camp, those guys don't know what they're doing."

As an example, once we had compressor problems at New Harbor and when we finally got a good compressor, one of my guys was on the plane and the pilot just dropped it. "Do you feel that thing swinging? Looks dangerous, doesn't it?" Pulled the plug on the whole compressor, he released it in the air and it was smashed and we were out the compressor for the season. I had the guy on the radio in the plane, it wasn't a

problem, he was bringing us the compressor, and it was hung under the plane in a sling which is the way you do it. He dropped it and laughed about it.

So we have this sort of problem. They dusted our camp, and by this time I was pretty experienced with helos, and Eric Vetter had been a medic in 101 Airborne, and he knew all about helos and dusting things.

PETER: What is dusting?

PAUL: Dusting is where you take a helicopter as a big fan and blow stuff around on the ground. So they would come over and --

PETER: So it's an aggressive behavior to screw something up?

PAUL: Oh, it's very aggressive. They never came by our field station without trying to blow our tents over. In fact, if we were expecting some planes or we heard one coming, we would take the tents down and put stuff on them because the tents don't have that good pegs anyway, so they always did manage to blow some around. So this was just routine, dusting us.

One time at New Harbor when we were doing microbial ecology with Judi Hansen and they had brought up a centrifuge and a refrigerator, we had to have really good temperature control on the bacterial stuff. So all of this expensive gear came, and he put it down and now it is sitting out there by the Jamesway. He lifts off, and it's just like a hair blower -- he just blows this expensive equipment down the hill. You know, a refrigerator is supposed to stay right side up, so it's doing cartwheels, and you could just see the two pilots in there just having a great time.

There were some pilots that were particularly bad and I still remember their name tags, Sherman Bronsig, Bryce Graham and Kehoe and Stihl. Their badges on their little uniforms are emblazoned in my mind. Given how exciting our research was and how wonderful it is to be privileged to work in the Antarctic, it is too bad that these memories are still with me.

PETER: So, they are actively screwing up the scientific work -- that has to be triple underlined here, and they knew it.

PAUL: Absolutely. For example, once John Pearse had come out to New Harbor, and he is really sort of the grand old man, and everybody, including me, was respectful and very anxious to help. He had a Coleman stove that didn't have its fuel container, it was just a stove, but it hadn't been wrapped by the certified hazmat authority. Bryce Graham saw it, leapt out of the helicopter, came running over and chewed me out, really chewed me out in a personal and profane way. I'm actually just there trying to help them unload because I was already there, it's not my flight or anything. Finally he got to his real villain, poor old Pearse. Pearse didn't even know that it was there, he didn't know what was going on, and I think to this day he doesn't know why he was getting chewed out so nastily and so aggressively. They didn't even look to see that they'd

actually taken the fuel canister out of the stove and it was actually wrapped in the damn hazmat box.

So this is the scene in the late 1980s, and the radio calling in was just a nightmare for me. It was almost impossible to get through from Salmon Bay which is where I had my worst problems.

New Harbor was a problem also until I learned I could get better reception from the ridge south of the Explorer's Cove site. Up on the ridge is a big rock, conspicuous from the camp. It is a pretty good walk up to get to it. I had to go and huddle by the rock trying to get out of the wind every single morning at seven o'clock. There is always a very cold wind up there as I tried to call in. I sat there huddling by the rock and the box with the battery and equipment, with that radio phone trying my best to get through the old squeaky contacts. Eventually I ran a phone wire up to that rock and had a little box with a battery that I carried up, it was a car battery, and I hauled that thing up there myself. I spent some time running the line up there and established the receiver by that rock on the hill at New Harbor so that we could check in from the building. It was a lot easier with the phone.

I would make my request for things that were sort of routine resupplies. I would make them with whomever I was talking to, and at that point most of the things we needed were from the Bio Lab, so you'd just phone the Bio Lab. The manager always was our friend and they were really helpful. One of the best of several really helpful guys was Steve Kottzmeier.

So I would give him the list of things I needed, but it didn't go through all the paper work demanded by Ann Peebles, the very nasty contractor who insisted on piles of paperwork and groveling and things to get stuff like food. I would get these really nasty letters from her and the NSF rep about going through channels, and not to use Steve. Some of her notes are in the field notebooks I will give the library eventually. This is what it had deteriorated to in the 1980s.

PETER: Well, you reach a tipping point where the hassle and the overhead of working there and all of that was no longer worth the scientific endeavor.

PAUL: In my mind, you have to have some pretty good scientific reason to go through with it. Let's just stay on this thread and maybe move it up 20 years from when I got kicked out in 1989 to 2010 when they let me return. So I'll read off the lists of things that you have to do now.

PETER: Well, it's amazing to me how you stuck with it so long. I guess it creeps up on you.

PAUL: It does, it creeps up on you, and the frustrations. I didn't realize how angry I was in the 1970s and 1980s until I went back 20 years later in 2010, an old man, deaf and everything and being taken care of like I was some sort of important person and absolutely having the time of

my life. Every time I heard a helo down there in 2010, I got angry, because those guys were just so ugly in my memory. So here I am almost 70 years old having the time of my life -- and the helo pilots in 2010, they are professional, they are really really good, and they are nice guys, they're very good and helpful. There's no reason for me to get my blood pressure shooting off the scales every time a plane goes by. And I knew that, I couldn't talk myself out of spiking blood pressure no matter how stupid it was and how wonderful the pilots are now. It is embarrassing to admit my problem, but it gives an idea of the intensity of the frustrations in the 1980s

PETER: You had other scientific interests that weren't just Antarctica, so you didn't have your eggs all in that one basket. That was fortunate, I'd say.

PAUL: Fortunate for me. Actually, it was fortunate for me that I got kicked out of the program. I became a much better parent and a much better graduate advisor and a much better person for the things I did instead of fighting these silly battles. The science was worth it. The only sort of lingering anger I have about being thrown out was that Judith A. Hansen and I were on the verge of making a breakthrough which will never be made and is extremely important. And it related to the bacterial activity in the deeper benthos, the diving deep at 140 feet depth. It's orders of magnitude slower than anyplace in the world, any place even in the deep sea. It took her two seasons to realize that they weren't artifacts. I learned this in 1968. One of Chuck Galt's programs in 1968 was to actually plate out bacteria, because I knew bacteria were important, we knew that even in the 1960s, so I really wanted to look at bacteria.

We plated things out and did everything we were supposed to, and put them in a +1 degree fridge, the coldest fridge we could find. Nothing happened for weeks and weeks. Finally we were at the end of the season and I went to clean out the fridge, which would have been two and a half or three months since we plated them, and all of those plates were slowly growing bacteria of different colors, and it looked just like classical bacteria samples that normally happen overnight or in three days or something.

So I knew that there was something going on, and Judi finally agreed to come with the state of the art techniques she had developed in Australia. At that point she was probably one of the better microbial ecologists around. She was well-trained at University of Georgia Marine Institute at Sapelo Island, and Western Australia and Australian Institute of Marine Science. She was very good, she worked with the best, and we never got to go back after we did all of these preliminary things and saw that these slow rates were real. We never got to go back and finish it.

I'm resentful, because it won't get done now. At the time we were using labeled stuff. It was tritiated leucine I think. We were using labels, we were doing state-of-the-art research that Judi had done and sort of pioneered in Australia in the barrier reef at 30 feet where you could stay

for a couple hours. We were doing it shivering and colder than hell at 140 feet, lying there motionless, injecting leucine into tubes.

PETER: So you can't even conduct work at that depth now because of the diving rules.

PAUL: Right, and the Kiwi program went down and tried to do it, but the Kiwis can't go anywhere near that deep because of their really restrictive rules, and they have to stay near shore to get to the bottom. So the Kiwis repeated my stuff, and they did it at New Harbor where we were working, but they were doing it at 80 feet or something, and it's very different. There's a lot of productivity at 80 feet. But if they had gone out to the middle of New Harbor at 140 feet, they'd have seen what Judi and I saw, but they can't do it either. Nobody will do it, it will never be done.

But now the changes are amazing. Instead of of bribing and fighting with people to do their job, these guys that are actually on the surface interacting with the scientists are some of the most wonderful human beings I have ever seen. They were terrific. Did you work with Rob Robbins?

PETER: Yes. You went down with Stacy Kim's project in 2010?

PAUL: Right, we were with Stacy, and Stacy knows the hoops.

PETER: She knows all the paperwork?

PAUL: Yeah, she did all of that, she organized us and made sure that we did all of that and so on. So it's the only way I was ever going to get back. But I think Rob Robbins and Steve Rupp, the diving people, those guys are like Jim Stewart at his prime. They are very very good. They obey the rules and they do everything they can to help - they go way beyond any reasonable expectation. With Stewart they are the best DSOs I've ever seen in that sort of situation. It used to be that it was all about controlling and interfering and being powerful and nasty. They are the complete opposite: what do you need, how I can I help and here is a better approach and if we can get free we will come and help. Hell, they often went out and collected things for me on their own! They are absolutely wonderful people. I wish they were here in the off season as they would be my best friends. They really are good at what they do, and it's safe. They obey the rules, but they don't bludgeon you with them, and they help you.

In fact, Rob Robbins found a place -- did you dive the Cape Evans wall?

PETER: No, I did not.

PAUL: It's the most impressive dive that I've never done.

PETER: I got there after my friends went diving there. Evans Wall has the soft coral *Gersemia antarctica*, on that side of the Sound.

PAUL: It's got everything, it's an amazing place. Rob just found it because it looked interesting and these guys are out there helping, going out of their way to help. Unbelievable.

The same thing for the guy that runs the drill rig. When the drill arrived and we had easy access to the water, there was always booze and begging and groveling because they didn't want to go out in the cold and run a drill rig for some beaker. Often it seemed easier to dynamite than to use the drill rig.

Now there's a guy called LT. His name is Tom Holford, but he goes by LT. He's the same way. I couldn't believe my tired eyes. We go out there to put in a house, I think it's going to be a day and a half of shoveling the snow off, screwing with the house and things and then finally getting some guy to reluctantly come down and drill the hole with a drill rig. I go down there, and here is this guy with the drill rig warmed up and ready to go. He has a cat and he scrapes the snow off for you, makes a nice clearing, you could stay in your car for the whole operation if you have some warm vehicle. We would always stand around trying to help, but we weren't doing anything because LT did it all. So he scrapes the snow, then he puts the rig just where we want the hole, and in maybe 20 minutes, 15 or 20 minutes, he puts a hole through and it was 20 feet of ice that year. And it's just minutes to go through. Under normal conditions when you are looking at six or eight or 10 feet, it would a few minutes to drill a hole with LT.

But then we used to have to get the Nodwell and take several passes with the house to get it over that hole to because it was hard to get a house and the hole lined up and everything. This guy, he's in his Cat. We would go over and unbolt drill rig sled. He would then drive around, jump out of his vehicle, hitch up the house for us, drag it over, put it on the hole inevitably perfectly. We get it in and check, yup, the hole is right below, perfect, and LT is in his cab sitting up there smiling away, happy to be helping.

Then instead of just driving home for Miller time, he will back up his cat and doze all of the snow and slush and things around the house to seal the house from the wind. That was something else, we used to sit there with our shovels and do it in the wind. And he just does it, and actually when he sees you up on base, he says "You want any more holes?" He's dying to help.

PETER: This is blowing your mind based on your history...

PETER: My God, and the helo pilots, the same way. They are professionals. They can take a barrel of fuel and they will put it on the spot within maybe eight inches. They take pride in what they are doing. They know what needs to be done and they do it happily. They see you --

"How was that?" Unbelievable! The guys that interfaced with us were just unbelievable, just wonderful. Even without asking, they will bring things from Marble Point that they know we need, they help us move stuff around the broken ice, just unbelievable. God the scientists don't know how good they have it!

Another example -- we were out with a Tucker snowcat, and here is the old Tucker chugging along, and it's cold. We had been in a warm hut, and it was just a run into base, and if we broke down I could make it back, but I wasn't really dressed for the cold. Then the Tucker threw its track.

So I know how to deal with that and so especially did Bob Zook and others on our team. You unbolt the track, you jack it up. I know Stacy's team could have fixed it, and for sure they knew how to do it, but all we did was call in on the radio that works now, and somebody from our group comes out and gets us back for dinner. They come out, and we leave the Tucker out in the cold with the track off it. The next morning, there's the damned Tucker right there by the dive locker where we park it. Those guys had gone out in the cold, got the Tucker, fixed the track, brought it back, lubed it, gassed it up, and brought it over for us by breakfast. I don't even know their names, they were invisible to me, and I am still utterly in awe!

PETER: You were talking earlier about the difference, the juxtaposition.

PAUL: My God, think about it. When you think back to going down to the junkyard and recovering some tracks to prepare for future problems, or blow torching your gas line, my God, things are changed at that level. But at the top level, it is very controlled beyond any reason. It's just a control thing of contractors, you are beakers and they are in control of the big scene, and it's just cost-plus out of control.

PETER: Before you move on, let's say you are the young Paul Dayton an assistant professor, there's this great support in Antarctica and you've got ideas. There's a lot of academic pressure now to publish and it is a huge investment of time and energy to do scientific work in the Antarctic and plan and all this stuff, whereas you can go somewhere else and get results to publish on something for a lot less time and energy, right? So it's problematic, isn't it? It's better support than in your past, but the world has changed, where should someone be funneling their effort, because they've got to advance their career and get funding and all of these things. You had less pressure, perhaps?

PAUL: I don't know. I've always felt the pressure to try to do my work, and I think that's maybe the same. It's the quality of the questions and the types of ecological, coastal ecological questions that you can ask at McMurdo, it's still the best natural laboratory in the world in my mind. The various habitats one can access from McMurdo have to be the most diverse and fascinating places I have ever heard of. But it is just really hard to work there without somebody like Stacy to help you navigate the rules.

One rule that could be changed a little might be to set the diving limit at 140 instead of 130, it is not much but is important as the little extra depth allows you more interesting habitat, at least at New Harbor. It doesn't make that much difference to the physiology and the diving safety.

PETER: It's just a number?

PAUL: It's just a number, and Rob knows that. We obeyed it, Stacy obeys every rule, and following them is how she managed to keep programs going down there. If you don't have Stacy personally working for you, you will never get through those hurdles.

There were other good biologists there, and they are really excellent scientists. There is an acidification program for example, with some really good people, and they were frustrated by the rules. They get things done, but they are not diving, they're not doing our type of thing and they had Rob and Steve helping. I think that there are just extremely interesting problems and questions that one could ask, especially at New Harbor and in Salmon Bay.

PETER: New Harbor, with the 130 foot diving limits?

PAUL: 130 feet is deep enough for most stuff and it is a reasonable limit sort of based on steps in the old Navy tables. But with the extra 10 feet, we would have gotten to a bunch of my past experiments at New Harbor for which we had to use the ROV to get 10 feet deeper and it was nowhere as good as a diver. Any diver would agree that 10 feet does not make much difference in safety. But because the bottom is flat the extra 10 feet depth gets you to a much more interesting habitat. At any rate, I think the scientific questions are wonderful and still very exciting. And I think that there's a lot of benthic ecology questions that I would love to have been able to do. I'm glad I was here and not wasting my time fighting with those guys over my career, but had it been a really good support program all along and had I stayed there, I would've had a different career. I would not have been such a good parent and advisor to my students, but the science was, and it still is, really good. I think New Harbor and Salmon Bay are just ecological gold mines just waiting to be picked and I would love to have been able to work there over my career.

PETER: Where is Salmon Bay?

PAUL: It's an area south of New Harbor that is even more oligotrophic. Fascinating place. Judi Hansen had projects there too, we had bacterial stuff going on there too. Hard to work because we didn't have the building, but we were okay. We had the tents that the helos blew over, and we had a little Apple shaped portable building that we did our research in. We were okay logistically, but the science was really good.

I made a list of stuff we have to do now and the control freaks that are orchestrating it. Apart from this, if it were just relatively easy to work down there, it's worth it.

PETER: But a young assistant professor Paul Dayton would be adaptable, and like Stacy, you deal with stuff, right? When we get older, we don't want to do with certain stuff?

PAUL: I don't know, I think the people that are down there doing good work, and they are happy to be there. It might be hard for an assistant professor but great for a post doc or a tenured professor. The biologists that are there are excellent scientists. They're mostly working in the lakes, but they are very all really excellent scientists.

No, I still think that the Antarctic as a research place is really good. One of the most interesting places in the whole continent was Winter Quarters Bay before the Navy dumped a ship load of diesel fuel on it. It was soft mud, but it was on the eutrophic side of the Sound so there was productivity and food for the critters there that does not exist on the west side. It wasn't like New Harbor and Salmon Bay which has some soft mud, but it was soft mud with plankton energy advected in from the north unlike the other side of the Sound.

So we had Bulla, the snail that we have here at Mission Bay. And naticid predators. It was sort of like a Mission Bay in the Antarctic. It was a very interesting place. And yeah, there was a truck or barrel or other trash here and there, but the mud was clean, it was whitish, and a really interesting habitat.

Then -- and I want to nail this down better as it is all hearsay, because Oliver got the information, and either he's forgotten or he's clammed up, but he told me the story that he got from somebody, or I don't know if it was Navy or a contractor. I'm thinking it may have been in the late 1970s or early 1980s. They had a ship of fuel, and somebody left the hose in the water and they didn't realize that the pump was running, and so they pumped diesel under the ice all night. I don't think anybody really knows or they weren't telling how much diesel is in there. That place will never recover. It's poisonous. I just can't believe how awful it is. I really sort of think that there's a cover-up going on even now, because they have a contractor that has been doing environmental monitoring for a long time.

PETER: In that bay?

PAUL: Yeah, and around McMurdo Station as well. It is really good to have a monitoring program, but in this case I think it is a pretty shoddy program. Somebody in the NSF must really look after the program because they have been doing it for 25 years or something, and but the science is poor. They've done a good job keeping track of the roads and things and disturbances around the base. They have a good historical record of what is going on in McMurdo over the years and it is very interesting because

the NSF has made a huge effort to clean up the base. The base is dramatically cleaned up from the earlier days, there has been a huge and successful effort. They should be complimented for this successful effort. But contractor's use of random samples is really silly because when you are looking for change through time, you want to have site-specific places so that as things improve, you see it. You lose all that if you randomize the sampling sites each time as the incremental changes are lost in the large-scale patchiness. And the marine sampling is equally sophomoric because the depth strata are wrong for the ecology and the sampling is wrong for the animal distributions. They should look at the contaminated and equivalent uncontaminated areas so that as things improve you see it. With their random sampling, they are not seeing the improvement that I think is obvious around McMurdo, they have really cleaned the place up, and I think it looks a lot healthier. These guys really can't show it because of the poor sampling approach.

Finally, they don't do the diving because Rob does it. Rob has to do Winter Quarters Bay because he's a commercial diver, he has to get into his hazmat equipment and go down in and get that oily sludge and bring it up. But when the scientists does not do their own sampling they miss the natural history associated with changes.

So they gave a talk, and I asked about the diesel spill. Here they are working with god awful oily samples that I have seen, their hands are all slippery, and the guy says, "There's no diesel." He just denied it. In front of the whole room, and what am I going to do? I thought the guy was just lying through his teeth. I don't know if it's diesel, it's broken down, it was fuel oil when it went in. So I went up to him later and I said what do you mean? He says well, here is the chemical definition of diesel and it is not diesel. Maybe it is a semantic problem, but considering the horrific reality of their samples, to brush them away like that seems very suspicious to me.

PETER: Yeah, right.

PAUL: So I think they're covering it up, and that's too bad.

But let me get back and finish out. I think that in terms of cost-plus, the modern contractors would do Halliburton proud. For example, the chainsaws. The need for chainsaws is rare, maybe to cut some wood for construction purposes but mostly sea ice and with the drill rig, that need is rare now.

PETER: Are you talking about back in the day, or are you talking about now?

PAUL: No, right now. But even back in the day, the chainsaws were for us to cut ice with. That's the only thing that I ever saw them used for, but I grew up in logging camps, and I'm good at chainsaws. We just had these old saws, they were Homelites, they are probably like the Sears ones now.

You could fix them, they were just sort of rugged and repairable and slow and not very powerful, but they were perfectly adequate for the job.

Now they have a rack of Stihl saws. I think of them as the standard for the professional loggers. They are very powerful, fragile, and they need to be tuned all the time. I think they're actually sort of dangerous because they are so powerful. Instead of buying cheap saws, sort of like a Chevy pickup, they buy a Ferrari to haul things. It's not a bad analogy, but the Ferrari is hard to drive and so are Stihls.

One of our courses that we had to take, it was an hour training us to use the saws. So before we had to go to the chainsaw school, we had to watch a 45 minute Stihl video, which is a commercial on how to use a Stihl in the woods, but we had to look at that. Then we had to have this poor mechanic, who is a nice guy and really exceptionally good at his job tell us how to drive the Stihl. He really was an expert and so damned nice that if we ever wanted a saw he'd have probably come out and done the job for us. So they've got these Ferraris lined up to do a Chevy pickup job with Ferrari mechanics. And in the same sense, the old vehicles, the old Power Wagons and the wheeled vehicles that we used to use, we had both tracked and wheeled, but now they are gone to be replaced by have something called a Piston Bully. You can't believe what a complicated miserable thing that is. I think it's made in Switzerland and it's made for ski runs, it's for rich people to climb into this upholstered back with felt and things. It's a nightmare to run. To start it you have to follow a long list of procedures such as turning on or off the fuel lines, you have to do go through a long checklist. It's like an airplane. The thing is fragile, it breaks all the time. They are extraordinarily expensive and they work ok on smooth ice or snow, but not on dirt after the melt. And they are so complicated to maintain that I am sure they have to have another herd of mechanics to keep the damn things running. But that hour or so of being trained to drive that thing was necessary as it is really difficult. So the training was important.

There was one or maybe two remaining Tucker snowcats left, a reliable diesel, a 1984. In the early days the big Tucker Snocats were the best thing we could use when we could get it from the poobahs, because the Tuckers are powerful diesel engines on tracks. They could pull fish houses anywhere and never got stuck and were very reliable. They are really remarkable machines made in Medford, Oregon. I went up and visited the factory last fall to see if they had closed and that was why we were stuck with Piston Bullies. But the Tucker factory is still there, they're still making them, they're still diesels, and they'll make anything because it's a small little factory. They'll make whatever the Antarctic people want, they'll make it, and you could probably buy four Tuckers probably or maybe five for one piston bully, and the Tucker works and is easily maintained. I can't understand why we need a fleet of piston bullies that, like the Stihl chain saws, are too fragile for that system.

The Tucker is so reliable. You put the heating plug in, you don't need a glow plug anymore for the most part, the diesels just start most of the

time without the glow plug. It's bombproof, and it's relatively cheap. But they don't use the Tucker snowcat, they use these piston bullies because of the cost-plus I think.

So these are examples. But the thing that really boggled my mind was the control of scientists and everybody. Everybody there is treated like a moron, like you don't have a brain and you have to go through these courses before you can do anything. So before we could go out on the ice - - I'm going to run through a list of courses we had to do. It took us 11 days. There were eight or ten of us there, and I don't know how much, somebody said several thousand dollars a day per person when you add it all up. Waiting -- we had to line up, sign up, take these courses, get certified before we could go out and do our research. The courses were good, sometimes not necessary, but good courses taught by competent and nice people.

For me with a Macintosh instead of a PC, there was a considerable hassle getting my computer certified to be virus-free, so I could plug the thing into the system and do my e-mail or just have it there at McMurdo. Certainly that is reasonable, but still a fair amount of time.

Then there's something called Happy Camp, which in the early days was a really good idea for the field parties. They go out on the ice and they learned survival skills in the early days from the Kiwis. So it's a good idea for the people that need it. But the survival school now is a really good school if you're going to climb Everest or work someplace where there is snow.

We went out, and it was really cold, it was early October. You go out by the windward area by Scott Base, out beyond Scott Base where it's really cold and windy and there is a lot of snow, and you camp overnight. They show you how to make snow caves, how to dig holes in the snow, which we never worked around. You don't get snow out on the ice, you just get ice. So it is important to learn how to set up tents and things that they teach you, and then we have to camp in the tent or the snow cave. People are all frostbitten, your face has got the white patches on them. You all survive it and Happy Camp is a tradition that everybody that leaves the base has to go through happy camp, I think they call it.

The teachers are really good. Again, it's this whole thing -- you don't blame the messengers. Those guys are wonderful. They were Alaskans, they are outdoors people, they are basically professional outdoors people, they are very very good, and they are very nice. They make you go spend two days out there freezing to teach us things we don't need. We work on the hard ice, and I think people should know how to set up their tents on the hard ice, but you don't have to go through all of that to do it.

Before you get into the lab and get your lab badge so that you could get through the door to come to work in the morning -- you have to have an electronic badge. And to get the badge, you have to have an hour-long tour of the Crary labs. And again, they're nice people, they're helpful,

they're showing you where things are. It's a great service. I don't mind doing it and I always appreciated their great and friendly help, but I could do that while I'm doing my research if I needed something.

The driving school... you go to a big lecture in the mess hall with a PowerPoint for an hour of the traffic rules at McMurdo Station. There are five stop signs or seven or something, and he has pictures of them. You have to stop. And if you don't stop, if you run a sign, somebody turns you in and you get called up and chewed out. Everybody is coming to a complete stop and pausing and looking around to see whether Big Brother is looking before they go through any of the stop signs. This is an hour just to drive a vehicle in town.

There's the sea ice school, which was a full day, and it's taught by the same guy that does the survival school. He is a great guy. He's trying his best to do what he is supposed to do. For that day it was cold again, and you go way out by Cape Evans where you learn to drill holes in the ice, to gauge the thickness of the ice, you learn to recognize a tide crack, that you don't drive into it. You learn to make the holes, and something useful if you are camping on the ice. For example, they have these really nice ice screws made out of MIG jets. We never had gear like that and it is great to have it and learn how to twist it into the ice; They just go right into the ice really lickety-split, they are really great.

So I learned how to put in ice screws in case I did want to set up a tent, which I definitely did want to do. So that's great, but you don't need to spend a whole day on it.

And the irony to me is I used to this in my own safety course.

PETER: For your scientific group.

PAUL: Yeah, I did it here, and I spent a fair amount of time on the sea ice. But it is the transition zone (where the ice meets the shore) that will break your leg because you can't tell where you're going to fall through. The transition zone can be genuinely dangerous. We never touched that in training in 2010, so that was maybe the only flaw I saw. The transition zone is a nightmare because the ice is all broken up and the holes and cracks are covered with hard windblown snow that you fall through not knowing what is beneath you. Rather than a day out near Evans, an hour around Hut Point in the transition zone would have been very helpful to people who have not done it before, but not everybody every year.

There's another school and a course for driving track vehicles. It was about an hour and a half, and we got to drive all of the track vehicles, and it was fun. I like to drive, so it was okay, but it took time.

There is another course for wheeled vehicles and trucks. The main thing is that you really do need to check the oil before you drive away, and

it's very important to unplug the heater plug. That is the main take-home message from another hour there. That was done by one of the only person with a real chip on her shoulder that interfaced with us. It was a lady I called Sally Blue (Sally Lyon I think), because she wore baby blue clothes all of the time. She harked back to the hostile age. All the other people that I interacted with were just human jewels, just wonderful, but she was seemed unnecessarily hostile.

So there was a tour for an hour or so of the food locker, which for somebody like me who was always interested, and she didn't mind if I filled my pockets with Cadburys and things, which I did. I had died and gone to heaven.

There was two hours with Mac Ops to learn how to phone in and how it's important to phone in because if you don't phone you are going to be in trouble. It was all about control, but with very nice people.

Two cold hours on snow machines, for which you always have to take this really heavy survival bag to carry with you. So we learned to drive snow machines, which again are like the chainsaws. They are really good, temperamental, but high-performance snow machines and the training was essential for me as they are totally different from other ones I have used.

PETER: By snow machines you mean snowmobiles?

PAUL: Yes, snow machines is what I always called them. In Alaska it is the term, anyway. In the 1960s we just called them Polaris, and everybody knew what you were talking about. One of my old Polaris I used to drive now is in the Christchurch Museum. That made me very happy to see this old Polaris that I drove around.

There is a small engine school, which again was important because there are lots of little small engines that you use. They are complicated, they have different rules, so you want to know this material and the guy was exceptionally competent and helpful. Indeed, that whole team was world-class working on temperamental and difficult machines like the new snow melter.

There's a two-hour lecture on protecting the environment, which involves peeing in little bottles, you can't pee outdoors anywhere, even on the ice where it can't be much of an environmental impact. But the class had a lot more and covered some important stuff, especially for people new to the Antarctic.

Basically the programs were all good - wonderfully friendly competent people doing their jobs very well. It's just the fact that you have to go through these things before we could go out and do our job.

PETER: So that changed since the 1980s.

PAUL: Oh, my goodness, yes.

There was a diving locker check out, which for us was useful obviously, and then the divers got checked out very competently by those guys.

There's a lecture on helo ops, which again, you've got to know the rules around helicopters. I'm not objecting to the material.

Then there's a waste recycling lecture about you have to separate your paper, and there's a whole hour learning how to put things into recycling containers.

Again, I'm okay with that, but it took us eleven days to get to be allowed to go out on the ice in 2010. That's a significant fraction of your field season, and the strong controlling attitude about rules seemed insulting. I don't mind learning things, but we could have been learning the things that we need to learn on the run, as it were, rather than wasting 11 days of a tight schedule to complete all of them.

PETER: Doesn't that harken back to what I asked you? That's a huge amount of a scientist's time that if you were working in an easier and accessible marine environment, you could have been gathering data and doing all sorts of things. It's a huge time investment to go there to do scientific work.

PAUL: And the other thing is that there is a massive bureaucratic nightmare getting all the forms done.

PETER: Upfront, the paperwork?

PAUL: The paperwork upfront, because if you don't think of everything you need, it becomes a real issue. It's a major and very important time sink.

PETER: Well then I'll re-ask my question. If you're an assistant professor and you really got to get your career going and get work out, Antarctica, that's a huge investment of time, reducing your scientific productivity for that amount of time, I would argue you could be much more productive if you could figure out interesting problems locally, right?

PAUL: Right. But I still defend the value of the questions that can be addressed at McMurdo.

PETER: And for publication, you've just got to come up with something interesting and great to have a career. Your academic review doesn't care if your work is off La Jolla or in McMurdo, you've got to get published. I think that's what I was trying to get at earlier.

PAUL: I agree with you, but I didn't want to denigrate the value of the Antarctic habitat.

PETER: I'm not, I'm just saying there is extreme pressure for academics to get work out and get published.

PAUL: For somebody like me, an old fart. I'm so glad that Stacy took me down and I got that in 2010, it's changing the Antarctic history of understanding the sponge community because of what we learned. The Germans just yesterday sent me a really neat paper, which is pretty much predicated on the stuff I told them a couple of years ago.

PETER: And that's all based on your data going back to the 1960s? Long-term data.

PAUL: Yeah, so Stacy's ability to get me down there ended up making an important contribution to the Antarctic benthic community. I say that without any humility because I had misled the science with my earlier work.

PETER: Right, long-term data are rare and important --

PAUL: But I couldn't, I wouldn't know how to fill out the paperwork that she fills out even before going down and being forced to do these required courses before going to work. I wouldn't know how to fill it out, and get it done right so that I could have my project.

So I think that the Antarctic as an ecological science for somebody new is practically a lost cause. For the lake people and the acidification people, I mean that's their only world, that's all they have. They go through this, but they get off base right away. For the most part those are field programs that are out in the field away from all of this.

Then they can enjoy that wonderful helicopter support. Now they take tractor trains to get gear to Marble Point. They took all our stuff over to New Harbor, it was all hauled over in a tractor, the big stuff, on a sled, and then huge amounts of stuff are taken to Marble Point. So the logistics are just spectacular.

I mean, I think of the early people that I worked with, if they could see what I saw in 2010 they would just be stunned. [LAUGHING] I was. I still am. And yet you still have this bureaucracy, which I think kills the assistant professors that you were worrying about.

Would I send a student down there going out in the scientific world? No, you're right.

PETER: No, because they've got to get their dissertation out?

PAUL: You're right, you've got to have a fast and effective academic life. You've got to have Stacy. If you don't have a Stacy, you are SOL for a program like mine. In contrast our program in the 1960s was in addition to our theses for Gordy and me.

PETER: And Stacy Kim's qualities would be, one must be very organized and systematic about this with of all of these requirements and paperwork and all of this stuff, right?

PAUL: And she's friendly. The people down there know her, and she obeys the rules. Oh, my God, some of the rules I didn't even get into. For example, in the lab, they treat everything like a hazmat, a hazardous situation. We can't have coffee, we can't have cookies in the lab, and twice a week some lab cop comes down to see if your lab is being maintained cleanly. Can you imagine somebody coming in and checking out my office?

PETER: Lots of coffee and food around Scripps labs.

PAUL: Yeah, so Stacy obeys all of those rules. Ethanol is treated as a hazmat and simply preserving samples needs a lot of environmental control to be sure that nothing ever touches anything.

PETER: So the research environment there is going to select for certain individuals who will be successful.

PAUL: Yeah, let me tell you one other little horror story that just talks about the intractable nature of this whole system. The wall, my favorite underwater wall --

PETER: Dayton's Wall off Cape Armitage?

PAUL: Yeah, I have so much stuff there. It's critical to our program.

PETER: Stuff meaning structure on the bottom that you put down there?

PAUL: That's right, all of my experiments and things. It was one of the focal points of the research from the very beginning. You've been there, you know where it is. I measured it once. It's 1,000 feet actually from shoreline from below the helo pad to that hole because I could see -- in those days you could see the shore from there on the other side of the jetty so I had the visibility measurement. So it's a little under 1,000 feet to where that house is, maybe 700 feet from the jetty. It's an easy walk.

The fuel line goes across the ice between my research area and the base, the fuel line to the airstrip. Now it's just inconceivable that a scientist could be trusted to step over a fuel line, so you can't walk out on the ice straight to my house. You can walk on the ice, and people even walk in from the strip on the road. The road goes off about maybe half a mile where they have a bridge over the fuel line. So you go out several hundred meters, cross over the fuel line on a bridge, and then you come all the way back in to the house that you could practically hit with a baseball from camp. Well, maybe several throws for me; it's 300 yards, but it's an easy walk.

So that means then that I have to have a snow machine to go help the ROV team find the sites and work on them. That means I have to have two people, because you're on a snow machine and you can't be trusted on a snow machine by yourself. That means you have to have a survival bag which weighs 80 pounds or something and takes up all the space on the snow machine, and you can't leave it out by the snow machines because people might steal it. So that means I have to carry this thing that I can barely carry. It's not really 80 pounds, but it's probably 40 or 50. It's a heavy mother for an old fart. Our strong women could carry it, but I was having trouble. Old age.

But you have to take it out to the snow machine parking lot on the ice where they are all lined up out there. First you have to grovel to Sally Blue to get the machine which she says are all busy even though you look out and see them lined up, but once you have permission to take one, you have to find somebody to go with you, drag the survival bag out, and go through all of the rigmarole of getting the snow machine going, which is about 10 - 20 minutes even if it starts when it's supposed to. It's still a good 10 minutes just to get it there, and it's another 20 minutes to carry that crap out.

Meanwhile, I'm trying to get to that hole over there where they are running the ROV and they need me because I know where everything is underwater. They are having so much trouble with the ROV and I am doing stuff in the lab, and I have so much to do, I have to go back and forth.

Well, I can't go back and forth because I can't normally get a buddy to drive the snow machine out with me and help me carry the survival bag, to drive over that bridge and back to the house, and nobody wants to go out and waste time while I work with the ROV drivers and things. So it really did truncate my research to do something that, for God's sake, I could have walked over less than 10 minutes, and I think I might be trusted not to cut the hose.

PETER: To be able to step over it instead of step on it?

PAUL: To be able to step over a hose. Right. This is the type of thing that is simply insulting, and there was just no negotiating that. Stacy tried, I tried. Rules are rules. That's their attitude; 'we are in control here.'

So these are the types of things that sort of weigh on you. But I think I am way too negative about one of the most wonderful parts of my life. Can I have a few minutes more to switch over and try to recover the magic that the place has always had for me?

PETER: Yes, please go ahead.

PAUL: I was fixated on my memories of the support stuff rather than on the magic of the Antarctic that is so vital to almost everybody who has worked there. Obviously it is unique in the world, and it is also one of the

most wonderful places in the world and it has a special magic that just keeps on growing in your soul. I think most people would agree.

PETER: I agree.

PAUL: Because of its history and remoteness it was always mystical to me, and when I climbed out of the old Connie in 1963 I remember standing there looking at the odd vehicles on the ice such as weasels and Nodwells, the Kiwi's had their dog team, and I knew it was everything I had dreamed of and so much more. Over that year it turned out to be so much more than I ever might have imagined, all those trips to such spectacular and beautiful places, the animals that I had expected were better than I dreamed, the history with the huts and really with the trips to the dry valleys and Crozier that I had read about truly came to life. Each of those places had histories from the heroic age and we even found signs of the old heroes. God it was a life change experience for me. To be sure I had my ups and downs, but I simply cannot imagine anybody growing up so much in one year as I did that year. I was a totally different person when I left. To be sure, I moaned in my journal and was angry now and then, but the people I met, such as George Llano, John Twiss, Bill Austin, Phil Smith, Bob Rutford, Tom Berg and on and on have been truly the most inspirational people in my life. Nothing matches the wisdom I have acquired from John Twiss over the years and the scientific friends from the Antarctic are still some of my very best friends. And some of the best scientists I have ever known.

The magic is striking, overwhelming at times and subtle at other times. The perpetual whiteness is so very uplifting. I remember thinking even in the dark of the winter how wrong Dante was to describe his lowest hell the way he did when really it was so uplifting and wonderful. The sounds are embedded in your mind, from the windless silence when you are out on the ice and it is deeply cold, and then you hear the ice cracking, the seals through all that ice trilling, and your slow breathing with the tinkling as the vapor as your breath freezes. At the same time you always remember the howling and screaming gales with the low moaning of the wind in the power lines outside your building, struggling to walk against it in the dark feeling variations of the wind on your face as you move within a wind-shadow created by a building and then move out of the shadow, the twilight pinks of spring and fall with the nacreous and noctilucent clouds I had read about. But no photograph ever taken can even hint at those brilliantly bright nacreous clouds or the mysterious blue of the so very high noctilucent clouds. Or the magic of the first sighting of the sun after the long winter and thinking how it was for the explorers - Kelly Rennell and I drove up to Evans and Royds so I could experience what they had experienced and the memories still make me shiver.

The research even then somehow seemed impossible and maybe not real. The blood glacier, warm lakes under meters of ice, Bob Black's and Tom Berg's patterned ground, the distilled water Tony Gow extracted from the middle of the sea ice in early spring or the deep frozen springtails, tardigrads and rotifers or the deep diving seals and penguins. Somehow it still does

not seem possible and will always be magic to me. Do I have time to mention my research?

PETER: Please do.

PAUL: I don't know why I talked so long about the support system when my whole life revolved around the research I was trying to accomplish. I have talked enough about the 1960s, but I think of the 1970s as the John Oliver decade and the 1980s as the Jim Barry decade.

When I returned in the 1970s I knew I wanted to study recruitment biology and quantify the benthic productivity gradient that I realized was important to my system and I desperately wanted to take advantage of the calm conditions of that system that allowed us to establish experiments to evaluate the larval recruitment biology. At that time except for John Pearse's early work on one starfish that was reputed to have demersal larval, very little was known about larval biology in the entire Antarctic and I knew that Pearse was wrong about *Odontaster's* larvae as they had settled in structures off the bottom. And I was very anxious to try to work on soft bottoms. John Oliver was the perfect colleague to collaborate with and between us we learned a lot about larval settling biology. In fact, the first thing that the team led by Gordy Robilliard did early in 1974 was set up settling plates at various levels above the bottom and supported by floats off the bottom. This was done explicitly to measure the water column distribution of larvae that John had written were demersal. Finally in 2010 those ancient experiments demonstrated settling biology nobody had ever dreamed of.

But it was John Oliver that stimulated our work on the other side of the Sound and a paper that came from that changed our understanding of coastal ecology in the Antarctic and it was a terrific lesson to me about appreciating the importance of oceanography to marine ecology. With the help of Dan Watson and others we did get a rough measure of the large differences in benthic chlorophyll and we saw amazing recruitment biology we could never have anticipated simply with the reduction of anchor ice, we experimentally outplanted a species of acorn barnacle that had survived the ice ages on Pennell Bank.

One interesting development that was extremely useful to John Oliver's thesis was the aquarium with flowing sea water. For years Art DeVries had asked to have one built always being told it was not possible, it would all freeze and it was a big waste of money. So Art built his own! He put up a Jamesway near the water intake system and ran a line off that into his tanks in the heated Jamesway and as simple as that there was running sea water that Oliver was able to use, especially the year he wintered over.

Thinking through the things we did those years I realize that in addition to the interesting science, there were many important social breakthroughs for McMurdo Station. I remember arguing with Navy officers about having women at McMurdo and there had been a couple of tentative efforts with

teams of mature women who had flown in and gone into the field, but John's wife Donna was the first woman to winter over at McMurdo and as many of us had predicted, the men shaped up in her gentle presence and everybody behaved better than they had ever behaved in the winters before. Mary Alice McWinnie and companions had spend part of a winter the year before Donna but I think Donna was the first person to spend a complete year there.

For me the 1980s was characterized by my efforts to push other scientific boundaries with recruitment questions and especially with bacteriology while Jim Barry defined the oceanography in the Sound. We had wanted to better define the larger scale currents that drive all of the benthic ecology in the sound and Jim was and is an excellent scientist who simply could do anything including all sorts of oceanography. Jim's two papers rewrote the book that Jack Littlepage had started as a young graduate student in 1961. To be sure, Jack's paper is still the most remarkable and creative single coastal oceanography thesis I have ever heard of, but using crude equipment that we scrounged and begged and jury-rigged, Jim did a spectacular job of synthesizing the oceanographic processes for the entire region. I did mention the bacterial work that Judi Hansen and I were not allowed to complete by vindictive program managers, but over-all we accomplished an amazing amount of very high quality science in the 1980s. And the science truly was exciting, especially as we explored and studied the unique benthic community at Salmon Bay. But always I was utterly dependent upon Jim Barry who could do anything.

And in sincere appreciation for the support that we received, I regret focusing on the problems. The logistics that went into our programs boggle the mind. And our day-to-day operations really could not have been done without the various Biolab managers of the era and especially without the spectacular turn-around of the diving support. Some of this would be easier now with the huge number of really enthusiastic surface support But while I have been complaining, we relied on a great deal of helicopter support that one way or another made the difficult field work possible. In addition, we always received wonderful support from many of the support personnel we actually interacted with such that we became good friends with many of them. As I mentioned, I think much of this is thanks to Dave Bresnehan who really pushed the envelope to help us do the fieldwork that we did.

Finally I have to mention a couple little vignettes in defense of Wilkniss and the NSF. I'm not sure when it started, it might've started in the 1970s -- there were two I think extraordinarily dishonest NGOs that really soured me on the environmental movement. Now I know with much more experience how dishonest a lot of NGO environmentalists are considering my experiences with NRDC. The two really bad ones at that time in the Antarctic were the Environmental Defense Fund in the beginning, and Greenpeace.

The Environmental Defense Fund saw an environmental report somebody did for the NSF which had some bottom grab samples that somebody had taken

from Winter Quarters Bay before the oil spill. One of the samples, I think probably hit an old battery or something, something bad down there, so there was one sample of many that had high PCBs, and this was when the Bay was pretty clean.

So even though there were several other samples and the adjacent second grab was clean -- Bruce S. Manheim made a lot of money for the EDF. I've got his report and put it in the library, but as I recall they took that sample and blew it up to claim the entire bottom was like that and got thousands of dollars in donations to clean up the Antarctic because McMurdo Station was dirtier than anything in the United States. They took the single sample, extrapolated to the Sound and claimed we were dirtier than Boston Harbor that was in the press then for its polluted benthos. Sort of made our area look like a super fund site. And it sort of made me sick.

And then one of the NGOs claimed that our air pollution had killed off all the lichens in the area around the station and somebody had found bits of sponges on land and claimed that it was from our pollution. Of course sponges come up through the ice and do blow around naturally. At McMurdo Station, there aren't many lichens. And in fact, the lichens grow on really older rocks that aren't tumbling around like the volcanic gravel of Hut Point, the ground around Hut Point Peninsula is fairly fresh volcanic ash and gravel and stuff, so it's not a lichen habitat. But there are lichens over at Cape Evans and Cape Byrd and Cape Royds. So they claimed our air pollution killed off all of the lichens on Hut Point Peninsula. This is the sort of thing that was going on.

Greenpeace was also making probably millions of dollars in donations to clean up the Antarctic, and they actually set up their own base to police the NSF because cardboard and things were blowing around, which they really were. I don't think it was doing any environmental damage, but stuff was blowing around, especially after we had to treat everything as hasmat and box all of that unnecessary packing to take it on the helicopters. So there was plastic and things blowing around, which shouldn't have been blowing around, but it wasn't a disaster, it was just a nuisance type of environmental impact.

So they set up their own base at Camp Evans right beside Scott's sacred hut for a year while some of these kids wintered over, policing the NSF. They had their snow machine, and they would come in and drive around taking samples of the snow, and they would go up onto the fueling area at McMurdo where you fuel up the vehicles, where there are some spills that they recorded. They take samples of that, and then that gets exaggerated through the press.

PETER: And it's not private property, so they can go freely where they wanted to?

PAUL: Oh, of course, they can go anywhere they want, and so they were all around the base doing those things when I was there. These exaggerations

contributed to this overkill in the environmental stuff where now they even weigh your poo and your pee when you are coming back in to make sure that you brought it all back in because they have a calculation of how much each of us should do. This isn't just the NSF. I think all the countries are supposed to do that. It's because of these two flamingly dishonest NGOs making money by talking about how the NSF is ruining the Antarctic.

Then, bloody hell, somebody went and dumped all that fluid in Winter Quarters Bay, and did ruin the best habitat. So, what the heck. During those years -- and I was fairly visible because I was working in the Antarctic and was around, I went to meetings fighting this stuff. I remember one in the New England Aquarium where I ranted about their dishonesty and defending the NSF at these meetings. They couldn't argue with me but they were very good at the political pivot in which they change the subject. They were interesting meetings.

I think that to be fair, Peter Wilkniss and Ed Todd had their hands tied. They had to deal with these NGOs and the press they created. I'm pretty depressed about the integrity of the environmental movement when it gets into big business like that. So that's something I wanted to get on to the record. I think a historian could get an interesting book from mining those old documents and the government responses.

PETER: Because you saw it there first-hand up close.

PAUL: Yeah, and you have a file of Manehim's doggerel and other stuff into one of those boxes you have.

PETER: Into the Paul Dayton papers in the Scripps Institution of Oceanography archives.

PAUL: The other issue I want to bring up that is a personally important has to do with my student that died. He was Jeff Rudd. He was there in 1975, he went to the ice before I did that season. They were out coring a road to Cape Evans, doing everything right. There were four of them in a Trackmaster vehicle. They were stopping every so often and coring the ice. It was six, eight feet. It was sort of normal.

PETER: So there wasn't a flag road put up on the sea ice?

PAUL: No, we didn't have flag roads. We made our own roads, and we didn't use flags because it was a lot of work to drill holes for the bamboo. We knew the way, and as you go with a track vehicle, the tracks compress the snow and it stays a long time, so you follow your own roads. When you get to tide cracks, you find the best place to go over the tide crack that is safe, and there we would put flags. So we would go over the tide cracks carefully.

But in this case it was the first trip out, and they were coring the road and they were out by the Erebus Glacier Tongue. They'd pulled up in the

Trackmaster just to stop to core. The guys didn't have their coats on because the Trackmaster had heat, it was a calm day. They would jump out, the core was out the back, you open the back door and put this core on out and vroom, then you get back in and you drive on another 300 or 400 yards and do it again.

Jeff was driving and he stopped on what we now know at the time was a snow bridge that he couldn't see. There was a tide crack that was just inches longer than the Trackmaster was long, and there had been a big storm and the snow had blown in and frozen. So this is a fairly common polar phenomenon of blowing snow freezing and being pretty hard.

PETER: And the crack was that wide?

PAUL: The crack was wider than the snow track, the Trackmaster, just a little bit. So they came up to a stop, it settled, and crack, it went through. The guy in the front right seat and the two guys in the back, got out while it was in the water -- one guy I think was dry, he jumped out so quickly that he scrambled up, and the other two were in the water.

And one of them got caught on the right-hand door as the Trackmaster went down. His feet were caught. The other two guys at this point, one was in the water holding him as best he could, the guy on shore was holding him, and so he didn't go down with his feet, but it pulled his boots off.

Jeff meanwhile had a brand-new camera that he had bought, and the last they saw of Jeff was he was turned to the right from driving this thing to grab his camera which was in the backseat. And he never got turned around and got back out, and he went down with the vehicle.

So the two guys that were in the water were trying to dive down and see if he was under the ice, and this was out by the Erebus Glacier Tongue.

PETER: It's deep there.

PAUL: He was at 1,500 feet before he knew it. These guys were out there without coats, maybe one of them had a coat. One of them didn't have shoes. Two of them were from Minnesota, so they were outdoors people to start with. The other one had been through my little course, so they sort of knew how to take care of themselves. And they did, they got back. They walked all the way back from the Erebus Glacier Tongue to the base without a frostbite or anything.

But Jeff was dead.

I was in Christchurch. Poor Margaret Lanyon, the lady that ran the Christchurch office, had to come find me. It was a really ugly, sad scene for me. It was just awful. Somebody had to tell Jeff's mother, and I knew that Jeff's father had just died of cancer. So Jeff's mother was dealing with that, and now somebody had to tell her about Jeff, her only son.

Rudford was involved. He was director at the time. He was very supportive, and I'm down there at Christchurch on the phone bawling and carrying on. Who is going to go tell the mother? So, poor Gordy Robilliard. The mother lived in the Bay Area where Gordy was, and old Gordy went out and told her. What an awful thing to ask of a friend and he did a terrific job. So this was a big thing that really shook me up very profoundly. I still don't know what I would have done without Gordy - man that guy earned a lifetime of my worship for sucking it up and doing that. I can't imagine how awful it was for him. Meanwhile everybody at Scripps was doing all sorts of things to be helpful, as was my wife of course. Sometimes you really don't know how many wonderful friends you have until something like that happens. And Rutford and Llano in the NSF were just extraordinarily helpful.

So the next year I set about getting a monument to put up for Jeff. I went to Ed O'Connor who had been down there. I think he may have been the guy who replaced Jeff. And Ed made up a really nice little monument, a rough hewn pole that is about maybe four feet tall. He had made it of brass but then he chromed it so it was all silvery, and the idea was that the silver would blow off in the wind and the gravel, and then the brass would streak green and it would be pretty.

So we had this monument that we were taking down with us, I think it was in 1977. We had it there, I managed to get a 100 lb bag of cement and another heavy bag of clean sand, and I had a plaque made up. Everything was ready to go, but we never really got it done for one reason or another during the season. We found the place to put it, and we had been down there with a pick and a chisel and cut a little hole into the permafrost so we could put the cement in. So anyway, on my last day it had to be done. It was very blustery cold weather, but it was my last day. So I got some people, It was Jerry Kooyman, Jim Barry, and I think John Oliver or maybe John Boland involved with putting this thing in. We got a couple 5 gallon containers of hot water because we knew the cement was going to be hard to mix in that cold. All of this was in the back of the Trackmaster, and a banana sled, and that big 100 pound bags of cement and a couple buckets of the clean sand. We planned to use buckets to mix the cement in, and took the monument and the marker and headed to the site at about midnight of my last night that season.

When we got there it was just god-awful weather. We had to drive along the shore in a lot of blowing snow. We really had very bad visibility. We left about midnight and went out. We had to go to the place because we'd dug the hole in the frozen ground, and we had to put it there because it was the only place we were going to get a hole dug. The hole isn't very deep, but it was maybe 200 meters up this hill, and the hill might be few hundred feet high. You know, it's not that big a deal. But the snowpack was awful and hip deep and very hard to walk in-- we fell through, and it was often at least waist deep. So we are pulling this banana sled, and we took turns breaking trail with the buckets, but mostly it was Jim Barry who was the strongest, and these two buckets that had the sand. We took

turns with the buckets breaking the way by swinging the buckets up and sort of throwing them into the snow where they buried themselves ahead of you, and then you would plow up and get them, lift them up and swing them up. We took turns as this was the hardest, but Jim did most of the work. The rest of us were trying to maneuver the banana sled with the 100 lbs of cement, the water and monument and plaque and stuff. To make it worse, there was a really strong wind right in our face freezing our skin and making it really hard to see through the driving sand-like snow particles blowing in our face.

It was the only time ever that I've actually used a balaclava to get my face covered. My glasses froze over from my breath coming out of the balaclava, so I had to put them in my pocket. So I have this balaclava and I can't see because I don't have my glasses and the snow was blowing into and freezing my face, and I was so damned frustrated because I knew that hot water was going to freeze solid before we could get there. I was bawling like a baby with frustration because I really wanted to get that in there, and we just weren't making much headway. I was really frustrated, an emotional wreck to start with because of Jeff and now this act of God preventing me from leaving something to remember him.

Finally we struggled up there, and everybody worked really fast, there was a horrible black cloud around us with the blasting wind screaming over you, and you hardly see anything. One person enlarged the hole with the chisel and then hammered the chisel deep into the permafrost as we mixed up the cement with the buckets and the hot water now cool at best so we had two buckets of the cement powder mixed now with the gravel that we carried up there in those buckets, and we were mixing as fast as we could with a little shovel we had.

So we got the monument in over the chisel and positioned it with the plaque, and got the monument sticking up there, and then we poured the cement around it. I thought it was going to freeze before it set, but it didn't. It went in and settled down, and the monument was standing up in the wind and it seemed that the base was solid.

Finally we just sort of paused because and took a deep breath and we stood there panting. And after all of this the tears were frozen on my cheek from the frustration and my balaclava was still all over my face, and I got my glasses back on and looked around to see that the black cloud was moving north where it was now hanging over the frozen Sound, and little bursts of bright sun beamed through it and one hit us and the shiny monument. I heard the others going ooo and aaahh experiencing something of a spiritual moment as this beam of light with the black cloud around us was reflecting off the monument on our faces.

I am sorry, I still get chocked up thinking about this. It was a very bad time for me and I was in a dark place in my life, and then this happened and it obviously affects me even now. But nature was not finished as we quietly experienced the wind dying and the black cloud moving north there were other beams of light shining through the cloud and there were little

flicks of white moving through the sun beams off in the distance with the black background and I thought at first it was ice on my glasses. But the flicks of white were actually circling us and eventually really did circle us up close in our sunbeam with the monument. They were a flock of snow petrels obviously circling right around us. I'd never seen them before. Jerry Kooyman had never seen them, but he and Jim knew what they were, and at that time Jerry said that they had never been seen south of Cape Hallett. I think they do show up at McMurdo now with global warming, but they weren't there then. It was so spiritual and unreal and you can see I still cry just thinking about them circling us in the beam of light with the black background and the sun now reflecting off the monument and these pure white birds circling us.

PETER: Wow. Magnificent.

PAUL: It was really neat. When I flew out the next day in the afternoon, I could see the glint of the monument from the Herc as we left McMurdo and flew up. Ed O'Connor himself then died a few years later leaving a little baby. Well, I don't know how old the baby was when he died. I think the baby was two or something when Ed died. The baby's name was Kevin, and Kevin O'Connor was with us in 2010. So Oliver and Stacy got Kevin down there and got us to the monument his father had made and I cried all over again, but I have a picture of the two of us there in 2010. I will put a picture of me after we put it in and the more recent one into the archives.

PETER: Oh, really? I recognize the name now from reading Stacy's blog. Yeah, that's wild.

PAUL: Yeah. So I just sort of wanted to end with something nice.

PETER: A nice memorial for your student.

PAUL: Yeah, I wanted that.

You know, it's just to my own sense from coming back sort of 50 years later, going to McMurdo, and it would be true for you too. The magic is still there. You watch the last sunset in October as it goes over Mount Discovery and then doesn't quite set the next day, and you are watching it at midnight every night. You are outside, your cheeks are hurting, and it's cold. You can look down and see Discovery Hut; it is still there. The ghosts are still there. It's magical - spiritual. It's still really neat.

PETER: To be able to build on your earlier work is special, you shared with me the PLOS paper on long-term sponge growth [Dayton PK, Kim S, Jarrell SC, Oliver JS, Hammerstrom K, et al. (2013) Recruitment, Growth and Mortality of an Antarctic Hexactinellid Sponge, *Anoxycalyx joubini*. PLoS ONE 8(2): e56939. doi:10.1371/journal.pone.0056939]. You wrote how things changed over 50 years, or didn't. I think that's really cool that

not only did you go back and see these things and all of this, but you had this great scientific work you got to do too.

PAUL: Thank you, and that is a good point to end it with. Because that return that Stacy engineered, -- for which I am extremely grateful -- it's really enhanced science. The entire Antarctic benthic ecology literature is based on our work from the 1960s, that things don't grow, and now we see that they episodically grow like mad. They did it from 2000 to 2010. All sorts of stuff happened. That's changed people's perception of that whole system.

PETER: I was surprised reading that article about how nothing seemed to much happen, and then boom, it took off, and then you tied it into the big iceberg grounding -- or you speculated rather.

PAUL: That's right. I knew it was so important that when we came back, the first thing I did was set up a trip on my own dime. I went over to Bremerhaven and my friends there organized a gathering for the people in Barcelona and Bremerhaven that work on the Antarctic, they were really the only benthic Antarctic ecologists working in that habitat in the world. So it is not a very big community, a small room full of people.

So I told them everything. So they knew, but they really needed it published so they could cite it, because now they are rewriting their own papers. Thank God we did get that out finally.

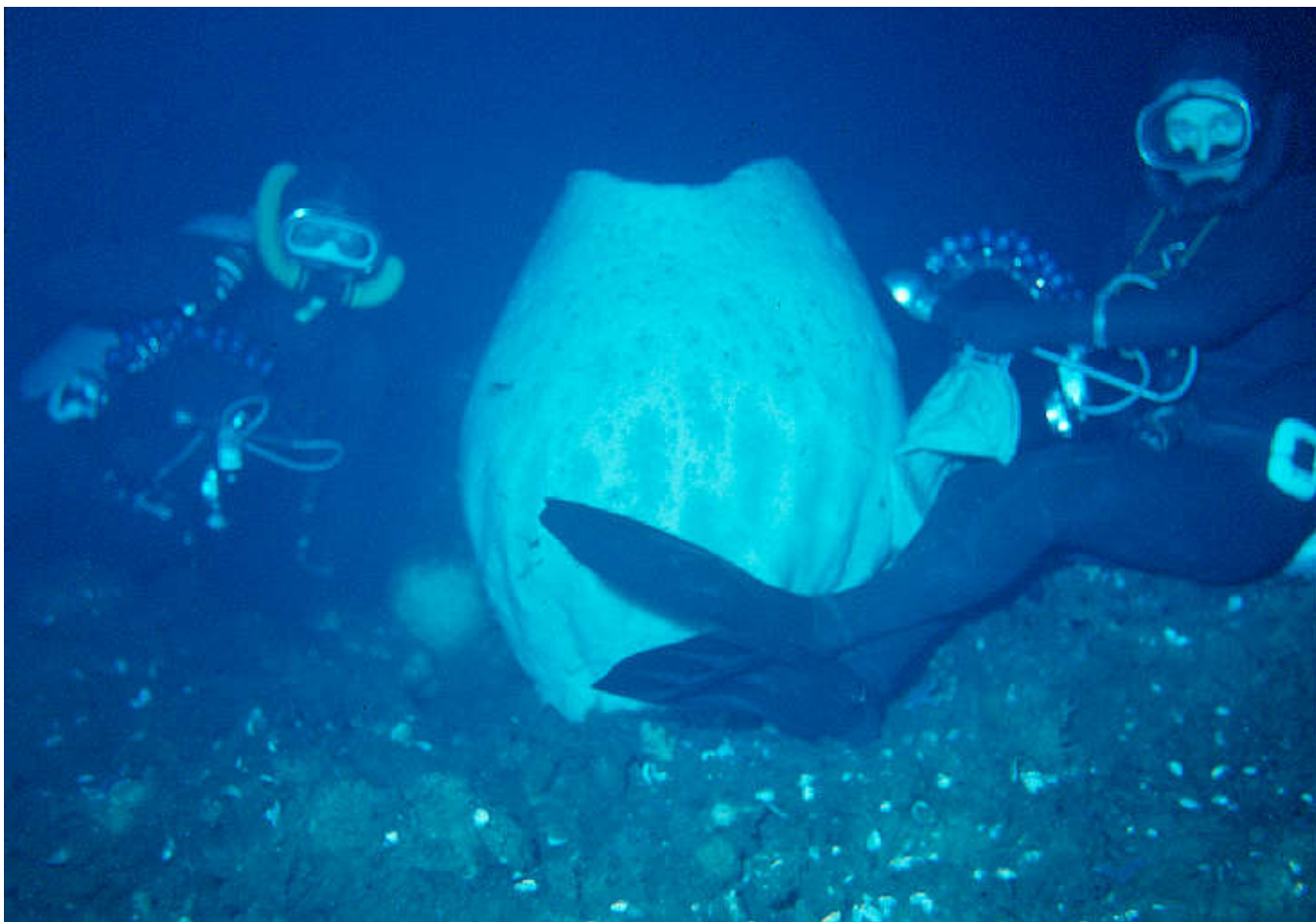
I was just thinking about Jeff and the fact that the magic is still around. I went up to Observation Hill where the old explorers sat looking south for their companions, I'm sure they sat there -- there is a cross there now, but there wasn't a cross there then. They were watching for companions to come back over many years, people were struggling back more dead than alive and staying in that Discovery hut for months waiting for the Sound to freeze. Year after year there were different parties, because they would always have two parties leaving out caches and things. So people were always struggling back barely alive, and there were people up there waiting for them.

I can sit up there and transform my little mind into their minds and be thinking how much they missed their families, and how they were worried about World War I. I can imagine just like my crying about Jeff, they were people -- Sir Charles Wright certainly was -- they were just people like us sitting on that same rock a little out of the wind, and you can sort of lean back and let the magic happen and experience the ghosts. I'm sure they were sitting there where I sat and I can see them and put myself into their minds and know I am feeling exactly the same emotions. In so many ways we are all one. The magic is always there. If you get back, you will see what I mean.

PETER: Okay.



Paul Dayton (left) and Chuck Galt (right) at Cape Armitage, McMurdo Station, carrying a meter stick and collecting bags, 1968 [Paul Dayton, personal communications, 2002 & 2004. Paul Dayton spent more than fifty months at McMurdo Sound, performing research during more than five hundred dives under the ice. The scientific papers that resulted from Dayton's extensive Antarctic research are believed to have set the standard for Antarctic benthic ecology.



Gordon Robilliard and Paul Dayton on 6 December 1967, with volcano sponge *Anoxycalyx (Scolymastra) joubini*, near McMurdo Station (Gerald Kooyman photo)



Paul

Dayton moves an exclusion cage at Cape Armitage, McMurdo Station, 1967 [Paul Dayton, personal communications, 2002 & 2004].

Oral History of Gordon Robilliard and Paul Dayton. 5 March 2012

PETER: Today is March Fifth, 2012 at Scripps Institution of Oceanography Archives. I'm Peter Brueggeman, and we are interviewing two charismatic individuals. They will introduce themselves and their affiliations and then I'll make some more remarks. Could you introduce yourselves, please?

PAUL: I'm Paul Dayton. I'm Professor Emeritus at Scripps.

GORDON: I'm Gordon Robilliard and I'm a Senior Consultant and Director Emeritus with Cardno ENTRIX, a private environmental consulting firm. I live in Gig Harbor, Washington.

PETER: As we have this conversation, when you refer to people, please refer to them by first name and last name. For the record, we need to know to whom you're referring. The famous example is "Curly" who is Donald Wohlschlag.

We're here to talk about how marine biology research got going at McMurdo Station in Antarctica in the mid-1960s. You two were definitely key players if you look back. You had really the first extensive diving research program there. The people before you were either, as we've learned from other interviews, in the water without the knowledge of the authorities, and/or just did a few dives. They didn't really have the free rein that you two did to do things. It didn't just happen from nothing that you went there and started diving to do

research. It would be interesting if you would talk about how you got into scuba diving, because this was a really early period in scuba diving which pretty much started in the 1950s. Equipment wasn't very good for regular diving in temperate or tropical waters let alone diving to depths >100 feet under 8' of ice in 28°F water 2000 miles from any recompression facilities. I certainly remember, for example, that not everybody had pressure gauges to know how much air they had in their tank; I didn't when I started out.

Could you first talk about how you got into scuba diving and then we'll talk about how that led into doing research at McMurdo.

PAUL: Maybe I'll just start and go through my scuba diving and then Gordon can talk about his. Then I'll go back to my diving experience in Antarctica. I started diving before Gordon did because I lived near the Gulf of California, and had just fallen in love with the underwater scene. However, I was not yet into the biology; I was mainly trying to kill fish.

I was having a hard time staying underwater by just snorkeling. At that point - this was 1954- we knew about Jacques Cousteau's scuba diving apparatus, but I'd never seen one. I just had seen pictures of it in an article in some magazine - *Scientific Mechanics* maybe.

GORDON: *Popular Science* maybe?

PAUL: Maybe. The article was how to build a B-29 regulator, which Cousteau modified to use underwater on an air tank. I was just a young teenager without even a driver's license, but I acquired

all the equipment, and made myself a tank that should have killed me. I acquired 3 discarded Fire Department air tanks from Pappadeas' Junk Yard on Stone Ave and used simple hardware pipes we threaded to hold the tanks together instead of any pressure system. We filled it off the big tank. I made quite a few dives with that setup before the regulator broke off and exploded behind my head.

This was in the '50s so then I went back to snorkeling and free diving. Then in the early '60s, you could buy single hose regulators. But my homemade rig was a double hose. In 1954 I think is pretty much when Jim Stewart, retired University of California Scripps Diving Officer, and the people at Scripps started their real science programs based on scuba diving operations. By the early '60s, I knew about them and I actually came out to the Scripps library to read their dive logs and fantasize about being a marine biologist.

We still didn't have wet suits. We had dry suits that we contrived variously but they always leaked and weren't very warm.

PETER: Like Bel Aqua dive suits?

PAUL: I had something with a thing in the middle that you tied up.

PETER: Front entry?

PAUL: Right. But the latex was bad quality in those days and it was always leaking. Wet suits were still not available to people like me anyway.

In summary, I started getting into more diving back in the very early '60s. I made quite a few dives in the Gulf of California as

a kid. Then in the '60s, I made quite a few more dives before the Antarctic program happened.

PETER: Your original motivation to dive was hunting for fish?

PAUL: That's an important point because I was just killing things, honestly, until Cousteau's movie came out. And then the book came out. It was "*Silent World*" that persuaded me that underwater nature was wonderful in its own right, but Cousteau was killing things in the movie and in the "*Silent World 2*" in those days, and so was I. I still feel really guilty for the things I killed even though we ate them all.

There was so much natural history that I learned in those books and movies that it just overwhelmed me. I kept killing and eating the fish but I spent almost all my time looking at the other critters after that. Cousteau's book had a huge influence on me when it came out in the early '50s.

GORDON: My diving career wasn't quite as dramatic a start. I grew up near Victoria, British Columbia, and spent a good share of my life till my early 20s (mid 1960s) near or on the marine environment. Like Paul, my goal was to: catch fish, crabs or shrimp; dig clams; collect oysters and other shell fish; and generally recreate on the water. I was generally aware of scuba diving but could not afford the equipment or lessons, and I was not nearly as adventuresome (or crazy?) as Paul to try to build my own scuba apparatus. However, when I started my graduate work at the University of Washington Friday Harbor Marine

Labs (FHL), I realized very quickly that if I was going to do anything like Paul was describing - that is be able to get underwater to study the submerged critters - I was going to have to learn to scuba dive. One of the marine technicians at FHL, Bob Myers, offered to teach me to dive. We started with snorkeling but quickly advanced to scuba. We borrowed some equipment and Bob gave me some basic lessons on use of the equipment and what to do if anything went wrong. I recall the primary safety rule was “Ascend as fast as your bubbles and keep on blowing out – do NOT hold your breath!!”

First dive I ever made was offshore in about 60 feet of water. Bob is a fishery biologist, he's a big strong guy, and he's got flippers that seemed five feet long to power his swimming underwater. We jumped in the water, and he took me down to the bottom.

PETER: What year was this about?

GORDON: 1965.

PETER: And in Washington State where the waters are devilishly cold.

GORDON: Yes, it was definitely cold. Bob, as a fisheries biologist, was a hunter, and he was swimming around with the fish to study them. I'm a benthic biologist and I was looking for nudibranch mollusks (also known as sea slugs). I was sitting more or less in one place looking for some critters. When I looked around, Bob was gone. So I learned to dive by myself from Day 1.

And as much as solo diving is now frowned upon, for the next six years, I did most of my diving at FHL and other non-Antarctic

locations by myself. I was at Friday Harbor most of that time as a graduate student. I probably made nearly two thousand dives in that time. I often made two or three dives a day, especially in the summertime when it wasn't quite so cold. It was all regular scuba equipment, with few specific modifications for the colder waters of the Washington/B.C. area. We did not even have Farmer John suits then. I spent quite a bit of time underwater.

PETER: At FHL, you just went diving straight off from the FHL shore?

GORDON: I dove all around the San Juan Islands plus British Columbia, Puget Sound, California, Hawaii, and anywhere else I could get a trip.

PETER: Also, beach or shore diving?

GORDON: I did some of that but most of it was from the boat. Sometimes I had a partner with me.

PETER: And FHL had its own compressor

GORDON: Yes, we had our compressor so we did not depend on a third party supplier for air. A good thing because, in those days, there were no commercial dive shops at Friday harbor. I was there by myself through most of fall, winter and spring quarters, except for the director of the lab and maybe a couple of other people.

PETER: You filled your own tank?

NEW SPEAKER: I had to look after myself. I maintained my own gear and fixed my own regulators when I had to. It was pretty much a *do-it-yourself* operation.

PETER: That is so different from institutional scientific diving these days.

GORDON: It definitely was different. In fact, in my last year at Friday Harbor, the director of the lab saw me coming in one day by myself. He made note of that by coming down and asking me if I'd been diving. I said, "Yes", and he said, "Don't let me see you going out or coming back again by yourself." He didn't say I couldn't do it; he just said don't let me see you doing it. And so he never acknowledged that saw me doing it again. It is definitely different now.

PAUL: That would have been late in the '60s, because we all dove by ourselves in the early-mid 1960s.

GORDON: In the last couple of years I was at FHL (1970-71), there was a move toward a much more structured, regulated and probably overall safer program with a Diving Officer, training requirements, etc. There was a group of us - Paul, myself, Charles Birkeland, Karl Mauzey, and three or four other people - who essentially were diving "fools" and who were all a combination of "old fashioned" underwater naturalists and budding research ecologists. We were amongst the first cohort of people around the country that started spending extensive time underwater learning the ecology and natural history of the subtidal critters and their habitats

PETER: Maybe your recreational diver buddy would not want to dive with you as a naturalist underwater because it's the same thing as diving with a photographer. If you're not doing the same thing, it's boring, because they are stuck in position and looking at something.

So you end up solo diving.

GORDON: Actually, I did a lot of underwater photography now that you bring it up. There was a real plus about not having somebody else with me or nearby because they didn't stir up the bottom. I had lots of problems with partners who would mess thing up for my photos.

PETER: So you had a lot of cold water diving experience by the time you hooked up with Paul for the Antarctic.

GORDON: That's the only place I'd done any diving. Even Monterey Bay, California was not especially warm.

PETER: That set you up perfectly for diving at McMurdo. It's not like you came from Florida.

GORDON: No. Definitely it was not.

PAUL: I had been diving with Gordon at FHL and in Puget Sound, so I knew about his diving experience in cold water when we got together for the Antarctic program. But maybe we should just go back to the early '60s, and get myself to McMurdo and back, because that's an important part of the story. I desperately wanted to become a marine biologist when I grew up. Earlier in my career, I had spent several summers doing archaeology including in the Arctic.

I put that Arctic experience in my graduate school applications and Donald Wohlschlag ('Curly') at Stanford saw that. He contacted me and asked if I would like to go to the Antarctic. That was almost a mythical place in 1962 and 1963, especially for me.

I agreed to do it and went down there. By my first

summer in the Antarctic, I had been diving a lot, probably much more than Jerry Kooyman, but he was down there with some fairly crude wet suit gear and made some dives, with me helping him.

I stayed down there for over a year from October 1963 until the end of 1964. I realized, looking down through the holes, that I could see the bottom almost anywhere in the nearshore. I realized that we could dive in this area even under the ice. Jerry had done some diving. Verne Peckham had made something like 37 reconnaissance dives before that and had taken a bunch of underwater pictures.

So I had a sense that a diving research program was something that could be done. It wasn't going to be my thesis at any time. When I went got back from McMurdo and went to the University of Washington, I started working in the intertidal which is a place where I could do solid ecological work with some assuredness of a successful dissertation in a reasonable time frame. It was easier to get access to my study areas and to manipulate environmental factors in my experiments. So my thesis was intertidal.

But, in the meantime I came off the *Ice* (the Old Antarctic Explorer's [OAE] fond and familiar description of the Antarctic) in January in 1965, and went straight to University of Washington (UW). I started negotiating with my major professor (Dr. Robert T. Paine) that he had to front an NSF-sponsored research grant in which I would go to the Antarctic and do a diving program. Bob was very supportive. He didn't know anything about the Antarctic and very little about diving (he is an intertidal ecologist), but he supported what we

were trying to do. I wrote the proposal with a lot of support and interaction with George Llano. I think the whole initial generation of marine biologists in the Antarctic owe their careers almost exclusively to George who was very supportive of students that were pushing the boundaries. George actually held my hand while I was writing the proposal.

It went in, probably late 1965, maybe early 1966.

Now we can jump forward in time. I'll probably come back and talk a little bit about the year I spent wintering over (1963-64). Even though I was not diving, it set the stage for a lot of what we were able to do, which is important.

PETER: Why would Bob Paine be supportive of you going to McMurdo if you were focusing on intertidal stuff?

PAUL: I persuaded him that the intertidal shut down (and it really sort of does) during the northern Fall and Winter, which is the southern hemisphere Spring and Summer.

PETER: It wouldn't impede your progress with your dissertation research that you went to Antarctica?

PAUL: Well, it could have, but being sort of compulsive, I talked him into it. I don't think it really did affect my intertidal research. I think without Antarctica, my experience would have been the same. Gordon, this was also true for you, right?

GORDON: The initiation of this project for me, was that I was literally sitting at my desk one day and Paul walked in to ask "Gordon, do you want to go to the Antarctic to go diving?" My

immediate response was “Sure, why not?” Paul may be compulsive, but I was (and still am) really compulsive. He said, “Okay” and turned around and walked out. (As an aside but background for such an impulsive decision, I grew up never being more than 150 miles from Victoria B.C. When I started graduate school, I vowed to myself that I would go anywhere in the world anyone wanted to send me to do marine research so long as it was supported financially. This Antarctic program was one of those opportunities and one I have never regretted.)

We discussed the program over the next few months. : What was the core research focus and what were the hypotheses to be tested? How would we test them? How we were going to get equipment together? What we were going to do with that kind of equipment? What are the logistics and equipment requirements for diving in deep water under 8’+ of ice in water that is 28°F? But, for me, it was a matter of “go for it”. Plus it seemed that this was all an academic discussion anyway because a graduate student proposal to dive in the Antarctic seemed unlikely to get funded in our lifetime.

A few months later, Paul walked in to my office and says, ”Get ready, our proposal is funded and we're going to the Antarctic.”

Then I asked myself “What did I get myself into?” I was in the same position as Paul with regard to my research. Whatever we did in the Antarctic was not integral to my dissertation project.

But my dissertation work on the ecology of subtidal nudibranchs was even less dominated by season et cetera than Paul’s

intertidal work. My major professor, Dr. Alan J. Kohn, was pretty flexible as he allowed that “It's your dissertation not mine, and it's all underwater so it really isn't seasonal to a large extent.”

When Paul came up with this opportunity to go to the Antarctic, I was really excited about the fact that I was going to do some traveling to places I never had any idea that I'd ever get to.

PETER: Paul, why did you want a second person along? You had some work conceived that you knew you needed to do?

PAUL: When I had wintered over, I worked with fish and did physiology respiration rates with fish. I was out on the ice all the time, catching them with traps. Frequently, I saw the seals coming up with fish in their mouth and I knew there was an interesting food chain there. The common impression is that the Antarctic is very cold and harsh and horrible. The scientific thing that interested me came from Jack Littlepage's thesis, specifically that in the Antarctic, underwater is physically very stable and extremely predictable. It has a seasonal plankton bloom but it's very predictable. So my entire concept was that this was maybe the best place in the world to look at a marine biological community in diving depth, not much influenced by physical disturbances, episodic events, climatic changes and other things. And it was a place whereby biological interactions would structure the communities completely.

PETER: So physical factors were part of your thinking about the Antarctic benthic community.

PAUL: Yes, I think my premise was good science. The

key was that I didn't know what was going on in the marine environment, except that I caught fish, and could look down to see pretty things on the bottom.

The whole program was predicated on seals eating fish, and fish eating the polychaete worms. I knew the fish ate worms from the gut contents because I was really quite familiar with the fish. I had a short food web in my mind where seals ate fish that ate worms.

My overall approach to test predator impacts, which somewhat mirrored my intertidal research and the vogue of the day for marine intertidal ecologists, was to put various size, type and configuration of cages on the bottom to include and/or exclude prey and predators. The grant bought us something like 60 heavy duty steel mesh cages coated with epoxy to minimize corrosion. We had them made in Seattle and shipped in huge crates to McMurdo.

We assembled the cages on the Ice over a period of several weeks between dives. We had to protect the fish from the seals, so we constructed several huge cages from galvanized pipe. They were about 6-7' feet long, 4' wide, and about 4' high as I recall. We tried to cover them with blankets so the fish would know it's a refuge. We also planned to look at the natural history of the polychaetes that the fish ate to see how they fit into the food web. It turned out that, after a few dives, we realized that the originally proposed program would not work. But, that is the nature and the background to the science.

PETER: You just answered my question, that's a lot of logistics right there, where you would need at least two people.

PAUL: There was never a doubt I was not going to do it by myself,

GORDON: Also, the Navy wouldn't let us do the diving as one person. They required at least a buddy diving system and they would have preferred, though did not require, that we had a surface tender.

PETER: The people who were solo diving were not doing it as part of an approved program?

PAUL: Some of the early divers for Zaneveld in 1963 were solo shore diving with a line, but beyond that I don't think I ever personally saw people solo diving in the Antarctic. That was just around Friday Harbor. That was never part of our plan.

PETER: You had to get somebody to dive with you.

PAUL: I had to get somebody. And because I wintered over, I knew how sensitive personalities were. Gordon had (and still does have) a pretty robust personality and I'd been with him a lot. I knew he was a strong guy who could deal with any stress and issues we had on the Ice. He was physically strong too; he often picked up both twin 72 scuba tank rigs, one in each hand, lifted and twisted them in the air and set them down in the back of the Power Wagon very gently!

So that's how we came together.

Another key issue was that the diving equipment was really primitive, especially compared to modern equipment, and we really had troubles over time with the regulators and things.

PETER: You had to provide your own equipment

whereas now it's supplied?

PAUL: Well, they had regulators for us but we had to get our wet suits. Just for perspective, at that time, wet suits were still not that popular or well-designed especially for real cold water. People were using them but there wasn't a science of them, to put it mildly. For example, one of our friends at Friday Harbor, Robert Vadas, got one from Harvey's in Seattle, the same place where we got ours for the second year (1968). Poor old Bob went diving alone off the pier at the FHL where he was in whole view of the classroom. Harvey's had glued his wet suit together with water soluble cement, so the seams dissolved, and we saw these pieces of neoprene floating up,

PETER: And they were not stitched?

PAUL: No, just glued. The neoprene floated up and pretty soon this naked pink butt came up out of the water. There is this guy swimming back pulling together neoprene ends plus the rest of his gear. As usual for a wet suit, he didn't have on a swimming suit. That was a lesson; always wear your swimming suit under your wet suit. Gordon, do you want to describe the first wet suits for the Antarctic.

GORDON: The first year, we designed the suits based on our knowledge of diving in the relatively cold winter-time waters of Puget Sound where water temperatures were in the high 40°F range. The material was ¼ inch nylon-lined neoprene so each piece would slide one over the other.

We had a vest that had full arms, full hood and beaver tail but no zipper. This we pulled on first over our head. Then we put

on Farmer John pants with the feet attached, no arms and no zipper. Finally we had an outer jacket with full arms, hood, beaver tail and a reverse zipper to about mid-chest level. We would pull this over the inner jacket and pants and zip it up. We had to have the reverse zipper, because we couldn't get the second jacket on without one, even with the nylon lining. And talc powder, a wet suit diver's panacea in those days, did not help with the outer jacket if there was no zipper. Believe me, we tried to get the outer jacket on without a zipper!

PETER: So you had three layers over your torso.

GORDON: Right.

PETER: And that was a pretty good water seal, theoretically.

GORDON: In theory. However, with the hard use we gave them, the suits would soon leak in three places: arm pits, back of your neck and the crotch. Besides being pretty sensitive places, they are also areas where body heat loss is the highest so we knew leakage there could result in hypothermia. All wet suits, even now, leak in these places even with modern advances in sewing seams and fancy glues, and re-engineered styling.

PAUL: Tell them about Harvey's and "bellying up to the bar".

GORDON: The next year (1968), we went to Harvey's where they were known to have better quality suits with exceptions such as Paul's story about Bob Vadas. Paul and I told the store manager (a young man with more macho than salesmanship) that we wanted him to

make custom-made wet suits we had designed as we were going to be diving in deep, cold water.

His immediate response was to tell us that “I can tell you how to make a suit like that because I dive in deep, cold water here in Puget Sound in the winter”. Now, normally Paul and I'd let this pass. But, I said “We're diving to 180 feet of water where the water temperature is 28°F. When was the last time you did that?” End of bragging and beginning of the process to get an improved wet suit system. We got our suits which served us well, though they still leaked in the back of the neck, armpits and crotch by the end of the season (about 150+dives).

PAUL: I think wet suits in the Antarctic were fine, but for the deep diving which we'll get to in a minute, they compressed down to almost nothing.

When you're walking around outdoors after a dive and it is literally -30 to -50°F, you could hear the gas bubbles in the neoprene popping and the rubber cracking as it got brittle in the cold.

After a month or so, because we were making two dives a day, those suits didn't have much to them.

PETER: You wore them out that fast?

GORDON: Yes, by the end of the season (150-200 dives), we threw them away with respect to using them in the Antarctic . They were still marginally useful for diving in Puget Sound, so we kept them as backup suits for our Washington diving research programs.

A major challenge was that we couldn't find a way to develop a glove that went on the end of the vest or outer jacket sleeve to

minimize leakage around the wrist. Maybe just as well, as our handling of shells, sponges, cages, other materials, and that sort of thing caused the fingers to wear out. We got to the point towards the end of the dives and especially towards the end of the season, where we were really functioning with clubs, not fingers, at the ends of our arms.

PETER: How long were you underwater.

GORDON: Most of the time we would be pushing the US Navy Repetitive Dive tables; which I had to teach Doctor Dayton about.

PAUL: We both have fond memories of the National Science Foundation (NSF) deciding that, if we were going to have this intensive program which they were supporting, then we had to satisfy the Navy that we were safe divers. So NSF agreed with the Navy that we would go to Key West Florida and go through the initial two weeks of an eight-week USN UDT (*aka* SEALs) training course at the Navy diving school. Getting the Navy to bless us turned out to be sort of interesting.

GORDON: We turned up at Miami in August which, for me, was really an experience. I looked around to find out where the sauna OFF switch was, it was so hot and humid. As background, we were at the beginning two weeks of what was a longer course for the Navy UDTs. So this was a serious diving course with the first two weeks focused on scuba gear. The UDTs then go on from there.

Upon check-in at the Navy Diving School, we were "invited" to turn up at 0500 the next morning for physical training (PT along with everybody else. We could run the two miles on the soft sandy

beach in our boots. Paul and I both allowed that we were civilians and we didn't think we wanted to do that or we needed to do that. We would be there at class at 0800. Well, already, we are bucking the system and not bending to authority and the Navy instructors, especially the Chief Petty Officer and Senior Navy Master Diver affectionately known to all as "Mother" didn't like that. Another thing they made us do is get in a pool and swim a hundred laps of the pool.

GORDON: I don't swim well. I can dog paddle but I never really learned to swim. That's why a diver has flippers and a wet suit for propulsion and flotation, and a snorkel for breathing.

When *Mother* wasn't looking, Paul and I switched out.

PAUL: I could swim so I did my laps fast. Then Gordon went out of the water and sat there pretending to be me. I went back in to swim Gordon 's laps. Thus he finished in time and passed the swim test.

GORDON: There are numerous other stories about our short stay at the Diving School, but there are at least two others that were pretty funny. First, they put us in a water tank, 80-foot tall, 10 feet in diameter and with a little window near the bottom. On a slate, "Mother" who was outside the tank, would write instructions such as "Switch regulators and buddy breath" and that sort of stuff. What he didn't tell us is that he put one of his divers in at the top who then came down behind Paul to grab Paul's regulator out of his mouth. Paul immediately turned around and grabbed his regulator in a basic but unplanned "buddy breathing situation".

PAUL: It seemed he was a buddy breather as far as I was concerned; no cause for panic! We got checked off on that one.

PETER: That was the old style of scuba instruction, creating stress situations.

PAUL: We weren't stressed; we were pissed off. Tell them about the class.

GORDON: Neither of us come from military families so we didn't understand that the instructor standing up there in front of a class is "God". He might be only an enlisted man and he might have admirals in the class, but even they don't argue with the instructor. We didn't know that. This instructor was going on about Boyles' Law, Henry's Law, Charles's Law, and a bunch of other things related to pressure effects, and he had them all mixed up.

PAUL: Couldn't prove it by me, I never heard of any of them. I am not fond of laws.

GORDON: Like any good graduate student in science, I was questioning and correcting him. That didn't go over very well. Finally he just stopped the class and said 'I'm going to go up and talk to the medical officer and get this straightened out. We will come back in ten minutes.' We came back in ten minutes and he screwed them all up all over again.

PAUL: But differently.

GORDON: Yes, so by now we had decided to adopt a "Never mind, let's just get through this and get out of here." But I'll have to say, as an aside, if I had to pick a diving partner to keep me out of

trouble, I'd go with a SEAL any day. They may not have known their theory but they sure are world-class divers.

PAUL: They got tired of us, so tell them about the final exam.

First though, let me just interrupt to give you an overview of the whole time frame of our planned two-week class. The first or second day, Gordon tried to educate the instructor on all these laws I never heard of. By the second day, we had done the thing where I ripped the mouthpiece out of the guy's mouth. Immediately after breakfast on the morning of the fourth day, we came in to talk to the commanding officer of the whole place and he decided we were experienced divers. So why don't we just run through the "final" exam.

GORDON: The final exam on Day 3 was probably not intended to be "final" but rather as a way of putting us upstarts in our place so we would be more humble and quit harassing the instructors. "Mother" and his crew put us on an LST and took us about a mile offshore in about 15 feet of water.

Mother instructed the three of us to jump in the water in scuba gear with a compass and a line between us. I had the compass. He pointed out that on shore about a mile away, there was a tall orange and white striped navigation pylon with two smaller pylons, one on either side. There was a hundred yards between the smaller pylons. We were to take a compass bearing on the pylon(s) and swim toward shore. We could come up three times in that distance to re-orient ourselves. When we got to shore, we had to be somewhere between those two outer pylons.

We also had a time limit though I do not recall what it was but it was generous.

PETER: Underwater navigation for a mile?

PAUL: I couldn't see the pylons. I never saw the beach. It was way far away.

GORDON: I could kind of see them but not very well. I had the compass and was in the middle. "Mother" didn't tell us a relatively strong current was running parallel to the beach; in fact he gave us no useful information at all so it was up to us. Once we were in the water we could see that the seagrass was laid over in the current so we could adjust easily for that. I had used a compass a lot in my research in the San Juan Islands and both Paul and I were used to diving with currents, so that was not a big deal. Paul and I started out, dragging along John McCain, the third diver who was going to be Dr. Joel Hedgpeth's post doc and assistant. Paul and I immediately began collecting shells and coral chunks.

PAUL: We had never been in the tropics so they were all new to us. We were loading them into our T shirts that we had taken off as makeshift collecting bags and eventually even into bathing suits.

GORDON: Every once in awhile, I would look at the compass to make sure we were headed to shore, note the seagrass direction, and adjust as necessary. Finally, after we had been swimming along humping the shirts full of treasures, Paul was poking me and indicating that we are in only three feet of water.

Well, we agreed to go up to see where we were and to

re-orient as necessary. We were about 25-50 yards offshore and we were dead center; that is, directly offshore of the center pylon. Now I'd like to tell you it was good navigation, but it was probably more by good luck than skill.

PAUL: We had “argued” all the way in because, though Gordon had the compass, I was looking at the ripple marks and seagrass. We were writing notes to each other in the stand and the poor John was just being towed along. Also, as we were getting near shore, we were lunging along with our shirts full of shells and corals, writing notes and arrows in the sand, and looking at the ripple marks. But we compromised and it was a miracle that we got there.

GORDON: It would be hard to say it was good planning but there we were and all Mother said was “Get on the #**!@! boat”.

PAUL: Though grudgingly, he told us that our time was the fastest in three years to be that close to dead on the marker and almost nobody does that.

PETER: And you didn't come up at any point?

GORDON: No, because we were too interested in all the shells, coral and other critters. Besides, we couldn't have come up; we were carrying too much weight. The next day (Day 4), we got called into the office of the Commanding Officer for the whole Navy Diving School. We figured that this could be interesting but had no clue why we were summoned. Well, it was interesting. The Captain said, “I see you guys want to go to the Antarctic to scuba dive and I see that you need

to be certified by the Navy that you're qualified to scuba dive there. You're obviously qualified divers. You have also been a royal pain in the ass for my instructors and disruptive of the class. So I'm signing your authorization, Now, you've got 20 minutes to get off my base and I don't want to ever see you again”.

GORDON: Aye, Aye Captain, we are gone!

PETER: Well, they'd seen plenty from the navigation that you knew how to dive and look after yourself in the water?

GORDON: They knew we could dive.

PAUL: We were the fastest and most accurate, even with our shirts full of shells and corals. However, by the sixth day in Florida, they were starting to smell pretty ripe. There were more adventures that we probably should skip over, but we had a good time in Florida, the Bahamas and Blue Ridge Mountains.

Another adventure leading up to the actual program on the Ice was that we had to have a Navy physical which was a big deal. We had to go to the Naval Hospital in Oakland California to get it from real Navy doctors.

PETER: To do research there, you had to go through a Navy approval process whereas now it's a National Science Foundation approval process. So that's really interesting, how you were colliding head on with the Navy environment to get approval.

GORDON: Well, it was pretty interesting in a lot of ways, even in the medicals. For example, I have a bunch of fillings and the dentist told me, “You can't be authorized to dive.” “Why not?” I

asked in my least offensive mode. “Well, you have fillings. You could get air in behind them and it could cause excruciating pain, etc. as you ascend” was his response. I allowed as how “I'd done about a thousand dives to this point and never had a problem with it. And besides I'm civilian; I am not trying to be a Navy diver.” He had to write down that I have these fillings and the Navy would not be responsible for fixing them if I had a problem and I could not require that the Navy compensate me for any needed dental work. But he did not indicate (in writing) that I was not qualified to dive. That was just one example.

Another one. They gave us these long (>20 page) multiple choice psychological tests that asked basically the same questions about five different ways; i.e., Are you gay? Would you kill people when you get mad? Do you fly off the handle? Are you suicidal? Do you suffer from depression? They ask you this in about a hundred different ways. I figured out the repetitive inanity after about three pages so I just filled in the choices randomly. The psychologist noted immediately that I was not taking this test seriously but decided that I was mentally fit enough to be a diving scientist and qualified me. I suspect that, were I in the Navy, his response might not have been so charitable but I think they just wanted to get us out of their hair.

Paul has this fear of needles. He is probably not afraid of anything else that I know of but if I pointed a needle at him (maybe even now), he'd faint. A couple of times when they took blood samples, I had to tell the technician to wait a minute. Before you touch him with that needle, let me get a hold of him so he doesn't hurt himself when he faints.

PAUL: I fainted.

GORDON: He did faint but he didn't hit the floor.

PAUL: Let's go into the first season then. After the all of this certification, orientation and everything else, we were ready to go in on the early October flights to McMurdo. Gordon was in a class in Hawaii so he couldn't go down with me right away. I went in on an early-mid September flight (fondly known as "WinFly"). By the time I got there, Jerry Kooyman who I helped in 1963 and 1964 was there with his diving suit. I had all of the diving, sampling, and cage gear to organize and get working.

PETER: Jerry had wintered over?

PAUL: No. He was just doing his work; he was there almost every year. He and I were on the ice. We got a hole in where you could see the bottom.

PETER: At Cape Armitage?

PAUL: Yes, it was right near that wall.

PETER: The wall meaning the one they call Dayton's Wall now at Cape Armitage.

PAUL: I did not name it. It was late winter and there are a few hours of dark periods in early September. For some reason, there was a lot of brash ice under the annual ice sheet so it was dark underwater.

Jerry and I found Verne Peckham's old underwater lights that needed a big generator for power. We lowered them down maybe 20 feet below the hole so we wouldn't get electrocuted. We cranked up the

lights that were hanging maybe 20 feet below the hole and dove in.

Having the extra light made me feel a little better on my first dive. I went down first and Jerry was going to follow me. My first experience and lasting impression was that, of course, the cold hits you in the face. And also that by the time you get through the hole (the first minute of a dive), you're already starting to get the cold. But, the most impressive thing was that you could see everything for long distances in all directions. It was one of those moments in your life that just stays with you. I swam out from underneath the hole and, with the lights below me shining down, I could hang there under the ice and look around to marvel at and integrate in great detail, the beauty of the place. It's just hard to imagine water that clear. We eventually measured visibility in one case and found it was about over nine hundred foot laterally where the snow cover was minimal and the ice was about 8 feet thick.

GORDON: The first dive I made in Antarctica was off Cape Armitage. We had cut a hole the old fashioned way with a chain saw (more on this later) and pulled our fish house over it. We looked down and could clearly see bottom with the starfish, nemertean worms, sea anemones, and sponges. So we hung a weighted rope in the hole along with Verne's lights but, in our excitement, neglected to measure the water depth. However, in retrospect, our experience diving other places in the world biased our judgment and we assumed it could not be very deep if we could see bottom that clearly. On this, my first dive, I preceded Paul on descent. By 100 feet, the bottom was still a ways off. By 150 feet on my depth gauge, it was not looking a lot closer. By 175 feet, we both

decided that the bottom was still too far off so we went back. After the dive, we measured the depth at 230 feet! THAT was a real eye-opener for me and we learned to be careful to measure the depth before we suited up when we went to new areas.

PAUL: So, to continue with my first dive with Jerry Kooyman, I could clearly see the bottom down there. The lights were illuminating it but I could see that, once my eyes got used to the dark, I didn't need the lights. I just went rolling down to the bottom, because it was right there.

When I looked up for Jerry, he was framed by those lights and he seemed about an inch long. I realized that I didn't have a depth gauge. I had thought we were going to be working at 30 or 40 feet like we did everything in Puget Sound and Friday Harbor.

PETER: The depth gauges were the wrist mounted ones?

PAUL: I had none. Gordon brought it down. It was a little thing where the bubble went around and you had to have a magnifying glass to read it. It was hopeless. So we did not have good depth gauges the first year. We figured out the depths once we started working, with a combination of actual measurement with a weighted line and, as the season wore on, by our observations of the benthic epifaunal zonation due to the anchor ice formation and uplift.

OK, I need to make a confession now that my diving career is over. I've never had a class in my life. I've never been certified by PADI, NAUI, YMCA, or anyone else. I didn't know about

dive tables or other depth related rules but I just knew that it was a deep dive. Kooyman wasn't coming down - he was still an inch long up there - so maybe that should have been a clue.

We came back up and we discussed how deep it was. Finally, we put a line down and we realized that it was pretty deep.

PETER: And that dive was just for you to check out the equipment and setting?

PAUL: Yes, just to see what it was like. It just blew me away because it was so beautiful. I was really stoked and I made a few more dives with Jerry. I think we put another hole in where the big structure is in above a wall. For the first dives, to be safe and to be sure we could come back to the location directly under the hole in the ice, we put a marker on the bottom. Basically a weight from which we ran lines all over the place. However these lines disturbed the benthic habitat that, even from the beginning, we could tell was physically stable and not disturbed. For the first few dives, we also used Verne's lights but the long cord provided too much drag and it tore up the bottom. Besides, we did not need the lights to see. So we quit using the lights and the cords.

PETER: Were these open-air holes, or were they inside a hut?

PAUL: It was inside a hut. That was my first dive and it's got to be still one of the most wonderful things I've ever done. Gordon came down pretty quickly after that.

PETER: Gordon, how long after were you there?

GORDON: I was there in early October, just a few

days after Paul. I got home from Hawaii, in mid September and, by the beginning of October, I was on my way to the Antarctic. The first time I jumped in that cold water, my body did not appreciate going from 78°F water to 29°F water; it was a real eye opener, to say the very least. It was a case of instant involuntary cryptorchidism that then lasted for three months of diving under the ice.

PETER: Did you have to do anything at McMurdo when you arrived, like sign-in or go through any training or anything?

PAUL: Everybody knew me because I had wintered over not too long before and I had been there for 15 months. No, we didn't have any special sign-in or orientation beyond what everyone had.

PETER: You just instantly started.

PAUL: We just got off the truck, found the equipment and start putting it together. That self confidence came from the experience of my wintering over. Once we made a few dives, it did not take long for us to realize that the seal-fish-polychaete food chain question wasn't going to work. It was a bad question.

But, the star fish were eating sponges all over the place. At that point, I was already working on the starfish paper with Chuck Birkeland at University of Washington where we laid out all of the foraging dynamics of Puget Sound starfish. It was the first paper like that, so we were into starfish predator-prey dynamics. Starfish were doing things we could see, measure and count, so we switched pretty fast I think.

PETER: Because you didn't see that much going on,

right?

PAUL: The fish could care less about our cages. I don't remember if we put them down there or not at that point; that is, early in the 1967 program. But I think we did put a couple in pretty early because they were covered with a blanket for awhile to make the cave look like a safe haven for fish but keep the seals out at the same time. But we gave up the seal exclusion/fish refuge hypothesis early when we realized that there was a lot of deep diving associated with a task that was unlikely to provide meaningful data. Also, I realized that most of the fish I had seen the seals eat were the Antarctic cod, *Dissostichus mawsoni*, which is found in deep water - much deeper than we could dive - and that the seals were not much preying on the small fish we saw in <150 feet.

The deep diving reminds me of a fairly interesting story. As I noted earlier, I had never been formally trained in scuba diving but Gordon had been, so he knew about dive tables and those gas laws. We realized we had to make two dives a day to get things done, so right from the beginning we were doing repetitive dives. I had never heard of the repetitive dive table.

PETER: Not even the Navy tables?

Paul: No. I started diving in 1954 when I was 13.

PETER: But in Florida at the Navy Diving School, of course you heard of it.

GORDON: No. They didn't bring it up. They couldn't even get Boyle's law right. I am sure that we would have been

exposed to the repetitive dive tables had we survived longer at the Dive School.

PAUL: So I got mad at Gordon who was giving me a hard time as he tried to tell me that the second dive had to be shorter and/or shallower. Especially as the first dive was sometimes 150 feet or more. Because I did not expect that the diving would be so deep when I was planning the program, it was something we never thought about (even if I had known about it).

PETER: Well, were you looking at a repetitive dive table and determining the required surface interval?

GORDON: No. In the beginning, I just knew that at 90 feet you had about 30 or 35 minutes bottom time. And I remembered a few of the other combinations down to about 130 feet.

PETER: That was for a single dive. But what did you do for multiple dives?

GORDON: After I realized we were going to be doing repetitive dives and to depth, we had this “discussion”. Some of our lab neighbors might say it was an argument that was pretty loud but it didn't turn violent.

PAUL: Yes, like “What do you mean I can't make the same deep and long duration dive twice in one day???”

GORDON: Anyway. We searched around at the Biology Lab at McMurdo, and by a fluke, we found the Navy dive tables. There it was in the Navy diving manual which, in those days, was THE bible for scuba divers. I probably did say “I told you so!” We suspected

that the manual may have been left over from one of the previous scientists who were diving and had the foresight to bring it with them.

PETER: So then, based on the depth of your first dive and duration, you would use the tables and determine how long you needed to remain in the surface between the dives and how deep you could go for how long on the next dive?

GORDON: Right.

PETER: So you tried to make your second dive shallower than your first?

GORDON: I think most of the time we tried to do that and we generally succeeded. Also, because the ice was eight feet thick, we could stop under the ice and put our hand on the ice, which put us at effectively our first recompression stop. Especially on the second dive, we'd stay there for 10 minutes or so though it sometimes was really hard to stay because we were really cold by that time. It was not uncommon at the end of the second dive, and occasionally even at the end of an especially deep first dive, to get out of the water suffering from mild hypothermia. Teeth chattering and shivering hard.

PETER: That was just on your air supply. You didn't put a reserve tank under the ice at the hole?

PAUL: No. We had plenty of air as we had double tanks filled to 3000 psi.

PETER: Double 72s?

GORDON: Yes and in the subsequent years we had some double 80s. For many dives, we probably could have done it just

on single tanks and still had air left over.

PAUL: The first year, especially, we didn't have tank pressure gauges so we didn't know what was in the tank while we were diving.

PETER: What about J valves?

PAUL: Those things always get flipped, when you're doing something so we did not trust them either.

PETER: Did you check them underwater to make sure they were up?

GORDON: It's hard to do that when you have all that wet suit rubber on your arms and torso.

One of the things you notice right away is that mobility and agility is very much impeded with the weights, tanks, wet suit rubber, sampling gear, camera, etc. on you plus we had awkward gloves or mitts with limited dexterity.

PETER: How much weight were you carrying?

PAUL: We both had eight to ten pounds which was considerably less than we used in Washington, and we had much more wet suit in the Antarctic.

PETER: Because the tanks weighed a lot?

PAUL: No, we were so deep that the suits compressed. It was so much easier with just eight to ten pounds. Once we figured out the repetitive dive tables, we kept track of our time. I did have a watch but I couldn't see it during the dive because it was dark down there. When we got back to the surface, we would record the elapsed time and

we would cheat on the depth by assuming either that we were slightly deeper on same-depth dives or longer at deeper portions of variable depth dives. We would calculate our tables as if we'd been at deeper depth and a stop longer.

So we were doubly conservative for the first year. We got the “Bendomatic” the second year (the SOS Dive Meter by Healthways and Scubapro). It was a relatively primitive “computer” that was supposed to account for time and depth, plus changes in depth, and emulate the Navy Repetitive Dive Tables. As it turned out, they were not very accurate or precise, and the error could be in either direction; i.e., too conservative or not conservative enough. There was apparently not much predictability as to which way any particular “Bendomatic” would register, at least in temperate waters. Well, they worked for us in the cold Antarctic. We could see when the needle was in the red even at depth, and ours were conservative in the cold when we compared them to the dive tables. They had us coming up sooner, and then stopping and staying at our stops longer than we needed to. We really got good at the tables after a while because we used them all the time. I had them so well memorized I could see where the equations changed with different variable depth profiles. We were careful and never got the “bends”, at least, not so as we noticed it.

PETER: Well managed.

GORDON: We had to be, because the nearest recompression chamber was in Christchurch, New Zealand, about 2400 miles away. And in those days it was flying on Lockheed Super

Constellations which flew at less than 300 miles an hour and typically about 20,000 foot altitude. It would have been a very long trip for someone suffering from the bends.

PETER: Plus going up in the air having the bends or decompression sickness would only make the problem much worse.

GORDON: It would not be a good day!

PAUL: We knew that.

GORDON: We would also have to be concerned that we might not even get out, as weather was always a major concern for flights to/from McMurdo in the 1960s. Finally, there might not be a plane on the Ice and it may have been a day or two before we even got the ride to New Zealand.

PETER: That's why you were conservative, because you knew it would be hell to pay.

PAUL: We were very careful.

The other thing were the adventures with the scientific support contractor. At this point, when Gordon and I went down, the scientific support was being provided by a commercial contractor Northstar, instead of Stanford University who lost that contract and Northstar, an outfit in Minnesota, took over. They didn't know anything about either scientific diving or the Antarctic in general. The examples were numerous and would have been funny, except that they really impacted our program. Some examples. We asked for a dive watch. I remember a whole bunch of communications with National Science Foundation (NSF) and Northstar that we wanted a dive watch. North Star

finally sent us an alarm clock in a bottle. Another example. We wanted neoprene glue so we could make repairs to our wet suits. This stuff was expensive and we were graduate students so we didn't have money for the things like this glue that Northstar was supposed to give us anyway.

We counted on them to get us our expensive glue to repair our wet suits. It was called "Black Magic". Northstar wanted the details on this Black Magic. There was all this correspondence with a lot of stupid questions (from my perspective) such as, "How much do you want?" "Give us two cans in case we lose one". Finally, being really generous, they sent us three big (quart size!) cans of Black Magic automobile putty for sealing windshields. At first, we couldn't figure out what this was for. Finally I made the connection. So we had to get our wet suit glue from other places. Gordon, do you want to go to filling the tanks hassle.

GORDON: Okay. First, I'd like to mention two things about which Paul will not blow his own horn. So I will because they are central to central to the function, scientific success, and overall safety record of how well it's gone over the past 45+years.

The first you have already heard a little about. As you go along in this dialog, we could come across as a couple of reckless cowboys. But, based on his prior experience on the Ice, Paul was very insistent about safety without imposing a lot of the silly, time and dollar-wasting CYA regulations and bureaucracy that are in place today. Because we were in a harsh and unforgiving cold environment, it would

be real easy to get seriously injured or die from one thing or another.

Paul and colleagues in other OAE interviews have described a number of incidents from the late 1950s and early 1960s that formed the basis for his safety regime. He harped on being careful about the ice conditions, especially how thick it was. Just because it looked like it was thick ice was not a good criterion; it might only be two inches of ice with snow blown over it. There were a lot of things like that that he made me aware of.

Another one that proved to be critical was that, when you're driving one of those heavy, tracked Nodwell vehicles, you drive and operate the controls with your right hand. You keep the left hand on the door handle all the time because, if anything goes wrong and the Nodwell starts to break through the ice, you have about three seconds to get out of it.

PAUL: One fell through the ice in 1975.

GORDON: With one of our colleagues in it. He didn't make it out and I had to inform his parents of the tragedy. So it's a good lesson. It was unfortunately reinforced but Paul was very adamant about that and many other safety aspects of the program.

The second point is the scientific approach that led to this program. This whole technical program started in 1964 when Paul first went down there. If you go look at the previous dialog when Paul was describing looking through the hole in the ice and making observations, you get some sense of the way he thinks. All of us make similar natural history observations but it takes a special scientific mind

to go the next step(s) and ask “Well, what does that mean? What's the question here? More important, what's the hypothesis to test here and, how am I going to test it given the circumstances in which I have to do this research?”

The whole program has been going on from 1964 to now; long enough that we can think of it as Paul's academic family of his graduate students, and their graduate students, and maybe graduate student's graduate students. Are you up to four generations yet?

PAUL: I don't know. I don't think so.

GORDON: The beginning of this program in 1963-64, was a graduate student, Paul, who really thought very intuitively about the ecology of this environment, and how things worked. Paul observed and then he asked the right (mostly) questions. He also asked a lot of questions that we couldn't answer at the time, but that he and students started to address in later research as they learned more. To be fair, he (and we) asked a lot of questions that, afterwards we could say were dumb ones!

There are lots of scientists who can *repeat* what Paul and his colleagues did. But there aren't many who can look at an ecological situation and initiate ground (or ice)-breaking research by asking themselves, “What's the next question? What's the next hypothesis or experiment here?” And then following through with a practical approach to test the hypothesis.

That may be the lead-in for Paul to describe the change in the program in the first few weeks of the first year. He made the

observations very quickly that the original proposed program wasn't going to work. So what else can we do? What's the other question here?

PETER: Before we leave safety behind, there's something else we should discuss. Diving there under the ice. You can get away from the hole and you can't see it after a while, especially when you pass the critical refraction angle for light underwater. You weren't diving tethered so you were diving free under eight feet of ice with a three-four foot hole as your only escape. Did you have any general practices such as you guys would just not go that are far away from the hole?

GORDON: We had two or three things to keep us oriented and within reach of the hole in an emergency. First, if you look up you can see the hole. It appears much like a can light in a pale white ceiling in a ballroom. You can be a long way from the vertical axis of the hole at depth and still see it, especially in the deeper dives. Second, most of the places we were diving were on a steep slope so we always knew which way was shallower or deeper. We were very confident of where we were relative to the hole.

PETER: You weren't on a flat featureless plain is what you're saying.

GORDON: Correct. And there were several big white sponges and other biological landmarks as well as airplane fuselages, construction debris and other junk that we could see over a long distance. Finally, we had a ladder in the hole and most of the time we had a rope with a weight hanging from the ladder. We could see that

as well. Often, we could hang stuff on the rope if we didn't want to go all the way back to the surface and that provided additional landmarks.

PAUL: We had the ladder and rope down all the time when we worked from our dive huts and we used the rope with a weight whenever we worked off the ice in remote locations.

And the other thing, you can see in some of the YouTube videos that people post from diving at that Cape Armitage site, there is a big, heavy metal plate with another heavy plate mounted on a pipe a couple feet long. This thing is sitting at about 75 ft depth and it marks the second hole that Jerry Kooyman and I put in after we found the bottom too deep in the first dive in 1967. I had the Navy make that because I knew from when I wintered over that the bloom came in very fast and was very thick. I was worried that the bloom could come in almost overnight and just be soup and might even happen while we were down. I didn't want to get lost. So we ran parachute cords from that structure all over the place and most of those little lines are still there almost 50 years later.

PETER: Like cave diving with secured guide lines.

PAUL: Right. Even though we could see, we were careful.

PETER: That's very careful.

PAUL: There were a couple of situations where we couldn't see the hole as we came up or swam towards where we thought it was. Sometimes, there would be a lot of brash ice under the sea ice and it would fill in the hole so it was not visible without the rope. Also,

when you are in shallow water or just a few feet under the ice, you are below the critical angle for the refractive index of light in water and the hole “disappears”. Then we needed the “down line” or we would have to swim to deeper water so the hole “reappeared”.

But what we learned in a month was that we knew that bottom so well, that we knew where that hole was. We didn't need those parachute cords and we never used them again.

GORDON: We were always aware, even subconsciously, where the hole was. Another anecdote and to emphasize the importance of knowing the location of the hole. The third time I went to McMurdo (1974), I took some of Paul's students down. I was his “project manager” while he was finishing teaching at SIO. I told both of them (John Oliver and Jeff Rude) that “When you go in that hole the first time, you're going to be worthless as a scientist for the first dive or two, because all you're going to do is look over your shoulder to make sure you know where that hole is.” Of course, both gave me the usual diver macho of “Oh, no, I've been diving for years and in all sorts of situations, so I will be fine.” Well, all of the first dive they spent looking over their shoulder to make sure they knew where the hole was. But, after a couple of dives, they were comfortable and worked like pros.

PETER: There were no alternative exits because you were not near a place where Weddell seals were hanging out and getting in and out of the water?

Gordon: No, most of the time we were remote from the seal breathing and haul-out holes. Even when they were close by, the

holes were often too small for us to use, especially if they were just being used by the seals for breathing; those holes might have an exit diameter of <12 inches. Even the haul-out holes were barely big enough for us to use especially with a double scuba rig and all the other crap we had on.

PAUL: We should probably talk about cutting the holes. We were short on holes the first years. Later when we had the drill rig, the place was like Swiss cheese. We had holes everywhere. In those early days, I learned how to cut a hole with a chain saw. The year that I wintered over, there was 15- 16 feet of ice. You cut out 100 pound blocks with a chain saw until the chain saw goes through the bottom and the hole floods. You still have a plug of ice that might be a foot or more thick. You have the 25 foot pipe with the big railroad chisel on the end of it that you spend up to a day and a half, hammering on the ice to knock that bottom out of the hole. You really can't stop because it is cold and the hole will freeze.

Then all the brash ice comes up and you have another almost day of cleaning it out, one net scoopful at a time. So, in the beginning, making a hole was really hard work. When I wintered over, I acquired by a "midnight requisition" a bunch of 60-40 dynamite. I had watched loggers in Oregon using it when I was 7-8 years old. I knew how to insert the cap and fuse. I took it way out on the ice in the dark winter and, with a little practice, learned how to blast a hole, but it still was a fair amount of work. The blasted ice still had to shoveled out of the hole along with the brash ice. I used the chain saw a little bit to make the hole square. So the holes were hard to come by.

There's a whole progression of the efficiency of hole-cutting. When we took the Navy diving school in 1967, one of the Navy guys asked how I made the holes and I told him. He suggested I use detonation cord (det cord). He said that, instead of pushing the blasting cap into the block of dynamite, wrap the det cord around the dynamite and then lead the cord away from the dynamite. Then you can put the package down the hole where it will not kill you if it goes off. Then tape the cap to the det cord and if it goes off you lose a finger but not your life. He showed me how to do that. That just made it so much safer and easier. But he also got us to use C-4, a plastic explosive, instead of 60-40, which I think he said was faster and really wonderful. At this point we just asked for it as though we were always issued huge boxes of C-4! We used that C-4 for the first two years (1967 and 1968). I went back to 60-40 dynamite because the C-4 just makes this awful mess. The water is all black and the ice around it is black.

GORDON: The black ring shows up underwater and makes the hole even more distinctive against the rest of the ice cover.

PETER: But you just had to open up one hole with C-4 to use for a season's work?

PAUL: No, we made lots of holes all over the place in McMurdo Sound. In those days, they were good with the helicopters that we used to get to remote sites. The pilots were mostly from Vietnam and they were used to explosives on board. We would just carry our det cord, hell box, and dynamite in a case on the chopper and have the caps in our pocket in the same chopper. We would drill a hole with the

Sipre drill (a hand auger), which is slow process, even in just a few feet of ice. --

GORDON: We had a gas-fired power head for the drill.

PAUL: Yes, but it didn't work too well much of the time. So we would have to turn the drill by hand. Then we would tape two or three blocks of C-4 to a bamboo stake and put it down the hole so the bottom block was just a little bit underneath the hole so some of the ice would be blown back up the hole.

We blew the holes and then worked for an hour or two cleaning the blasted ice and brash ice from the hole. If we were at a remote location such as Cape Evans or Cape Royds, we'd set up our tent and make our dives. We'd try to get in a second dive before the pickup. If we were at a site closer to McMurdo that we were going to use regularly, we pulled a hut over the hole so we had shelter and a working platform. So we went all over. And that was a lot of work but a hell of a lot of fun.

PETER: Would that hole stay open? I know they freeze up but could you get in it the next day when you came back?

PAUL: Yes.

GORDON: We came back to some of them even a week later. We might have to blow out two feet of ice or break it out with a chisel. After a couple of weeks, we generally had to repeat the drill-blast-scoop routine especially early in the season when it was cold.

Though we did not specify it so far, the diving season

was from about late September-early October which was the first WinFly to about mid-December when the dense plankton blooms moved in and visibility would go to almost zero in an hour to day as Paul mentioned earlier.

PETER: Was your working area along Ross Island up to Cape Evans from Cape Armitage?

PAUL: And Cape Bird, and Cape Royds.

PETER: Cape Bird... you had dives up there?

PAUL: Yes. And Horseshoe Bay behind Cape Royds. And then New Harbor in the '70s.

PETER: In the '70s. I was talking about early on.

PAUL: Gordon and I went out into the Daley Islands. And that was scary, because there was so much brash ice in the hole. It could choke you and you couldn't get out. So we only made a couple of dives there.

GORDON: Yes, really, that was spooky, because there was 10 to 15 feet of this brash ice in the hole. We could not "swim" our way through it, at least not quickly.

PETER: Are you talking about the brash ice floating underneath the sea ice ceiling getting into the hole? It was that thick?

GORDON: Well, it was even thicker than that away from the hole we blasted.

PAUL: Probably 30 feet thick.

GORDON: Because of the blast, it was kind of an inverted cone under the hole but it was still 10 to 15 feet there, and that

was after a couple hours of both of us scooping it out of the hole. We could get in and out of the hole, but we realized that if anything went wrong with a regulator, we wouldn't get through that brash ice in time; i.e., a minute or two.

PAUL: I just wanted to see what the benthic community looked like that far from the sea ice edge.

GORDON: It was a neat idea.

PAUL: The point is, we were getting around, making holes all over the place, but with a lot of effort.

GORDON: One of the criteria for making a hole in the ice was that we get a good picture of the blast against the spectacular scenery. I think I have a picture of almost every blast we made.

PAUL: There's a bunch of things that I wanted to talk about such as the routine of diving, the fact that our gloves were marginal, and we would come up from the dives cold. I don't like to emphasize that the cold because people think you're trying to be heroic or brave or we are trying to out-macho them. But we were cold, especially in the hands. The fingers in the gloves, especially the first year, would wear and we would sometimes have bare fingers. We would try and seal them with neoprene glue that we would borrow from people because the auto putty didn't work.

And we only had the one set of gloves. They would ride up and expose our wrists sometimes. For the first dives, we literally couldn't use our hands to grip the rungs and climb up the ladder.

PETER: Your hands were clubs, right?

PAUL: We used our elbows to crawl up the ladder and into the hut. We'd take our gloves off with our teeth and put our hands in hot water. Sometimes, we would still have the tanks on our backs because we couldn't get them off very easily. They had those funny loops and buckles, not the flip buckles that we got later.

I remember countless times where we're both sitting there with our tanks on our backs, our hands frozen and we would put them in hot water.

GORDON: It hurts!

PAUL: It really hurts! We'd be sitting there with tears running down our face because our hands hurt so much and, at the same time, we'd be excited. "Did you see that? Did you see that the patch of yellow sponges, the starfish doing such and such?" It was so damned exciting and fun that the cold hands were utterly irrelevant. It was so exciting that we just routinely did this ritual. It was like amputating our hand for a while and then finally the tingling quit. We'd be able to take the tank off and do those belt things, get out of our wet suits and then we poured the hot water over ourselves. Sometimes we had a stove on which we might have some water heating up and we just stand there and pour some water over ourselves trying to get warm. It felt good but it didn't do much for the core temperature.

GORDON: There was not much thermal transfer from just pouring hot water over us.

PAUL: I have a picture I think that Gordon took to show people how the body responds to cold. Remember we had three ¼

inch layers on our torso and only one on our legs and butt. Early in the season when it was really cold, the picture shows my torso is sort of normal color but my butt and legs were bright red. Later in the season, our bodies learned not to lose the body heat. So later in the season, peripheral blood vessels constricted as soon as we went in the water. It's a pretty interesting physiological adaptation in that my legs would be blue because my body wasn't losing as much body heat. Then we found two tubs that weren't tied down outside the USARP Chalet.

GORDON: Just to amplify the evolution of the warming process. We first tried just going to our office and sitting in front of a heater. Marginal success and took too long. Then we took showers at the barracks but that also was marginal and we got hassled for using too much water which had to be made on site from melted snow. Then we went to the hot water rinse Paul just described while standing in front of a roaring diesel-fired furnace in the hut. Then EUREKA! The USARP to the rescue.

PETER: USARP is the United States Antarctic Research Program and the Chalet was the scientific administration building.

GORDON: Yes. We realized the thermal transfer wasn't working very well by just pouring water over ourselves or even with showers. On the second dive every day we started out cold. Often, especially on deep dives, we'd come out of the water slightly hypothermic. Besides being somewhat unsafe, being really cold is not a very good way to get anything done, intellectually. One day, Paul and I

were driving by the USARP Chalet where they were having a party that we weren't invited to (or we chose to ignore). We noticed that, on the veranda, there are two galvanized tubs that are about four feet long, a foot and a half wide, and foot and a half deep. They were both full of beer and ice. In the same instant, we both said "Do you see what I see??" We backed the truck up, opened the tailgate, slid them in, and took off. We took them back to our fish house (which is what we called our dive huts) and we now had two bath tubs.

PAUL: We also kept the beer.

GORDON: Yes, we couldn't just leave the beer outside or it would freeze so we stored it on the floor where the temperature was just above freezing. We would fill those tubs up with hot water as soon as we got out of the water. That worked well as the thermal transfer was much more efficient. And we met the USARP Chief Scientist requirement that we not take such long showers in the barracks though I suspect that we actually used more water (10-15 gallons each) with these "bathtubs".

PAUL: Life was good.

GORDON: There is a picture of us in these tubs in the National Geographic in October 1968. That's the only picture that made it into National Geographic, of probably a thousand pictures I took for one of the National Geographic photographers. He came to McMurdo to do a National Geographic story about the Life on the Ice. He wasn't a diver but he wanted to get some underwater pictures so he gave me the film. I took the pictures with the agreement that he would give me copies of the

slides.

He did give me those slides though not without some serious hassle and threatening letters from me to the president of National Geographic. Of all the pictures we gave him, some of which were really good underwater pictures, that's the only one that made it into the story.

And we didn't even take that one.

PAUL: We did have something to keep our hands warm. There's some correspondence that I'll give you with a guy named Tinkelpaugh who made thermal cream. It was calcium chloride in glycerin. Calcium chloride reacts exothermically with water, so we put a greasy wad of calcium chloride in our hands in those old horrible gloves. When they leaked, which they did right away, the water reacted with calcium chloride. It would burn our palm so we sort of moved it around to distribute the heat.

It did work but everything got covered with the oily film of glycerin. And it just wasn't worth it as it messed up the camera lens, mask lens, and anything else we touched.

PETER: You didn't try glove development like gluing cork fabric on the outside of your gloves or anything like that?

GORDON: In the second year, we started to use different kinds of gloves. We worked with five-finger gloves under a big mitt and variations with long sleeves.

PETER: So you were constantly working on it.

PAUL: We didn't the first year though because we didn't expect the gloves to wear out. And we had nothing but Black

Magic “auto putty” to work with for repairs or new construction.

PETER: So then you came prepared the second time with lots of options?

PAUL: Yes. But our hands were still cold.

GORDON: Even when we got the Unisuit dry suit system in 1974 and the Diving Unlimited dry suits in 1984, my hands were still cold.

PETER: It is still a problem to this day.

PAUL: I still have all sorts of problems with arthritis from those dives that first year. Underwater photography was an example of the challenges the cold hands caused. Gordon had a better camera, but I borrowed an old Nikonos I that had these little tiny knobs that you had to adjust for both f-stop and focus. It's dark down there and I couldn't really see what I was looking at anyway. But I have this tiny knob to try to control with these fat cold fingers that had no feeling. Also, we had flash bulbs that we had to change with a big glove. After some practice, I got pretty fast with the flash bulb and could change that faster than the strobe would be recharged by far. But we were still using fat, cold, unfeeling fingers to adjust knobs, push the button to take a picture, reach someplace to pull out a single flash bulb from the neoprene holder, stick the bulb back into the reflector thing and all the while trying to keep your eye on your transect to remember where you were along it. So taking the pictures meant we had to have fingers on the gloves, not big mitts.

So we just had to put up with cold fingers and hands. It

just went with the business.

PETER: You mentioned working in the dark. So you didn't use any underwater lights?

PAUL: Yes, we did. We did give up the lights that were powered by a surface generator and went to hand-held dive lights. We had those great big metal things.

GORDON: Allen lamps. Because they were aluminum and we had to hang onto them, they would suck out whatever warmth we had in our hands.

PAUL: Literally caused me frostbite. We put neoprene on the handles to reduce heat loss. We did use them to signal each other if we wanted the other guy to come over and look at something real cool. We used these lights as often as we could but they ate those D cell batteries, ten of them at a time, and usually within three to five dives at best.

GORDON: The Navy and Northstar got tired of seeing us coming because they knew we were going to ask for another case of batteries.

We had some of the more modern lights later but, even at that in that cold water, they just wear out the batteries quickly. And the last time I was down there (1984), I had a re-chargeable light that worked well, but a charge lasted for only for a dive or two at best. I had the same problem with batteries for my SubSea camera strobes and those batteries became obsolete just prior to 1984.

PETER: Certain batteries don't work well in the cold.

PAUL: Maybe we should go through some of the diving adventures. Do you want to tell him about John McCain? The poor guy who had no clue what was going on at Navy Diving School while Gordon and I were collecting corals. He was tied off behind us and we had look after him on our last compass dive. He was a postdoctoral student for Dr. Joel Hedgpeth.

PETER: From what institution?

GORDON: He would have been at Oregon State University at the time.

He got down to McMurdo where he was qualified as a diver but, because he was by himself, he couldn't go in the water unless he could find some buddies. We knew Joel pretty well and so we agreed with Joel and John that, so long as John was not in our way and we didn't have to look after him, he could dive with us, because he wasn't going to be diving very often. He was collecting sea spiders, so that really did not interfere with what we were doing and he did not need to go far from the hole.

There were at least two incidents with John that were entertaining for us, though not so much for him. We didn't want him wandering around and getting lost or anything, and Joel was a little concerned about having his post doc in the water more or less alone. So Joel would let John dive with us but John had a rope tied to him and back to Joel in the dive hut.

PAUL: John was well tethered!

GORDON: They worked up the signal system. When

John pulled on the rope once, Joel was to let out more line. Pull it on twice, retrieve line slowly. Pull three times, drag as hard and fast you can. Joel got bored quickly so he tied the line off before John was on the bottom. There is John about three feet off the bottom pulling once on the line for more slack.

PAUL: Joel is out of the dive house wandering around to survey the scenery or whatever, having tied the line off on something.

GORDON: John is trying to do some collecting so he's tugging on the line and nothing is happening.

PAUL: We did our whole dive and here's this poor guy going round in circles pulling on the line and trying to get to the bottom.

GORDON: We couldn't figure out what was going on.

PETER: Poor guy.

GORDON: Incident two. As we already described, when we came out of the hole after a dive, we were darn cold and we just wanted to get out of the water and into a hot tub. When I would come up the ladder, I would take off my weight belt and throw it up on the floor. I told John two or three times, "Don't leave your mask on the floor near the hole!" He'd come up and leave the mask there. And I was afraid that one day, Paul or I would toss a weight belt on it. After all, the last thing I was worried about was his mask. So sure enough, one day, I just tossed my weight belt and "CRUNCH – SHATTER". There went his mask. Well, you couldn't buy a mask in the Antarctic at whatever they call that store down there (the PX). They just did not have a scuba shop there!

PETER: You didn't have dive tenders so while you're in the hole, you had to get your weight belt up and out. You didn't slip out of your tank and hand it to somebody so they could hoist it out. You got out of the water wearing your tank and most of the rest of your gear?

PAUL: We would often slip out of the tank because it would be close to neutrally buoyant anyway. The first one out would then retrieve the tanks so the second guy could climb out without his weight belt or tank.

PETER: First person out was the "tender" of sorts?

GORDON: We would switch off. Paul would go up first the first time. I'd go up first the second time.

PAUL: Meanwhile, John had been flailing for something like 40 minutes. He was first through the hole and he was sitting there with his mask on the floor. Gordon comes up, tosses weight belt, and "CRASH". And then I came up to find the weight belt on his crunched mask, and John sitting there on this stool, sobbing.

GORDON: It took him a week to get another mask.

PETER: Did you come to McMurdo with spare dive gear? You must have.

GORDON: I had another mask, but due to very poor vision, I had my lenses glued into the face plate. They were prescription so they were no good for anybody else.

PAUL: We never had close call in our diving that was serious.

GORDON: No, but we did have an exciting one.

That's a story we have to tell about Jimmy Stewart.

PAUL: The second year (1968) we got a dive tender of sorts. It was Chuck Galt, another graduate student at University of Washington. After taking his training at Scripps with Jimmy Stewart in the summer of 1968, Chuck came down to be our tender. The reason we were adamant that we needed a tender came from an outdoor dive in Horseshoe Bay in 1967. I really wanted to see Horseshoe Bay because it looked like a neat place. We had flown in and put up our Scott tent which is just a tent with the single pole in the middle. We didn't tie it down because, although it was really cold, there was no wind and it seemed to be OK. We spread it out and had a Coleman stove inside. It was really cold outside so we cranked up the stove and heated up the Scott tent. The Scott tent has two layers of material so there is a "dead air" space. Around door, these two layers can be tied off so it is actually pretty airtight and retains heat. The tent and stove were working fine. We blasted our hole, and went diving.

We did a long dive and I remember coming up really cold, with the hand problems and everything. They were really like stones. When I came up, there was just this gale blowing snow that hit me in the face. It just nailed me and my mask immediately had ice all over it so I couldn't see. The seawater froze before it could run off, it was that cold in the open air!

I took my mask off and then my eyelids froze and I was all messed up. I scraped some of the ice off and I was looking through little holes. I still have frostbite scar from around my cheeks where my

cheeks got frost-bitten, because I wanted to keep my eyes open.

Plus we had those horrible straps on those old tanks that you put a loop in it so you can pull it to undo them and get out of the tank. Except that they were chunks of ice so I couldn't undo the darn things. And Gordon is down there cold. I'm cold, my hands don't work, I can't see, I can't get my tanks or weight belt off. I can't really find my weight belt.

Finally, I crawled out to find the next obstacle to warmth! The tent had blown over. Luckily it hadn't blown away because we had stuff in it but it was over on the side. Gordon popped up and I yelled at him, "Leave your mask on". So he left his mask on but he couldn't see through the ice that built up on it. We both struggled out of the hole and helped each other out of the tanks and weight belt. The wet suits were, at this point, cracking all over the place from water freezing on, in and under the neoprene outer layers. We struggled into that bloody tent and got it upright. I was trying to start the stove, and Gordon was holding the two doors open. He's sitting between those two loops, and holding them open so I could see. I was pumping and pumping that white gas and putting my matches in the burners. It was just not working. I kept pumping and choking the damned thing with no flame at all. I didn't understand, until I dropped a match that was still burning, that the white gas wasn't vaporizing because it was so cold but that it was coming out as a liquid and pooling in the stove and floor. So now there's a puddle of white gas on fire and our clothes and things are inside the tent. Our hands don't work. Gordon may still have had his

mask on though maybe he took his mask off when we got out of the wind. Anyway, somehow the gas finally vaporized and here was this ball of fire on the floor of the stove and Gordon was still holding the door open so I could see. I scooped up the stove with its pool of burning gas and tossed it at the door. I hit the opening, fortunately, and it went out. As I recall, it blew up. We were standing there having survived a fire bomb and now no stove, but at least we still had shelter.

GORDON: No heat though.

PAUL: It was just one of those winds that comes off right near Cape Royds. It was just awful as we thought we were going to be there forever, because “What could fly in that wind?” We had no stove and thus no heat except body heat. And darn little of that. We had frozen K rations (K-rats) for food. We were able to get out of our diving gear and get dressed so we were no longer freezing to death. Eventually the helicopter came and it all worked out. But, that incident made us aware that we needed a tender.

PETER: Are you saying the practice then was to go out in the field without taking along survival gear and camping gear?

PAUL: No. We had that. I knew that from my earlier winter-over program. We did have bags of survival gear.

PETER: So if you had to camp --

PAUL: We would have survived for several days. Maybe we would have been hungry and probably cold but we would have survived. We had sleeping bags. I knew not to have them in the tent because one of my friends did have a tent burn up once with the sleeping

bags in it. All our survival gear was somewhere close by but outside the tent. So we weren't going to die.

GORDON: No, much as we felt like we were going to for awhile that day.

PAUL: We weren't comfortable and there was a real lesson in survival and the need for additional help.

PETER: That really illustrates what it's like to dive under the ice in Antarctic. Underwater it's perfectly still and calm and then you surface into these roaring conditions. Everyone wonders how you can dive underwater, it's so cold. They think that's the life-threatening issue for Antarctic diving. But, it's what you come out into after a dive that can be the biggest problem.

GORDON: Yes. There were lots of times when going underwater was much nicer than being outside when we were diving at remote spots. The air temperature, even when there was no wind was often 30°F and occasionally up to 60°F colder than the water at 28°F.

PAUL: Almost every time.

GORDON: It's good to have a tender, but it's even better to have a tender who pays attention. We had at least one incident, in addition to the John McCain–Joel Hedgepeth one described earlier, to illustrate this. We dove one time at the junction of the annual sea ice and the permanent ice shelf, right in front of the New Zealand station near McMurdo. At the junction, the annual ice is all broken and fractured, piled up, and there are lots of ice floes in a jumbled mess. We wanted to see if we could get to the bottom and see what it was like this far from the

usual edge of the annual sea ice.

One of the Navy support guys came over to be our tender. We gave him the basic signals which were the same as we described for the dives with John. He was going to feed the rope to us and haul us back if we needed it. We were also going to have the rope down so that we could follow it back if we had to. We were basically cave diving.

Well, it worked out fine, except that he didn't hang on to his end of the rope!

PAUL: He walked off to take pictures or something.

GORDON: The rope wasn't tied to anything; he just looped it over the door handle of the truck.

PAUL: Our descent and thus ascent had been back and forth because the ice was folded and broken. So we are counting on following the rope back. We were pulling on it gently as we came up until we are holding the end of the rope in our hands and we are not at the surface yet. That was a serious OSOD (Oh shit oh dear) moment!

PETER: That is so bad.

GORDON: Fortunately, we were most of the way back and we could see the ambient light so, we had some idea where to go to get out. I don't know what rank he was, but I bet he never had his ass reamed like he had it that time. I was pretty close to just throwing him in the water and leaving him there but Paul saved his life.

PAUL: Do you remember the time in 1967 when the BBC film crew showed up. They wanted us to get dressed in our wet suits

and ride a snow machine over to the dive hut while they filmed. This silly entrance rather than just go to the Hut Point dive house in a pickup or Nodwell like we always did, and get dressed and things. We just wouldn't do it. We told them that they could film us in our normal routine and that was all we were going to do. They got really obnoxious and even reported us to the USARP manager but he stood behind us for once. Then I saw them having some other people, dressed up in USARP garb and pretending to be in a wet suit. They came driving over on the snow machine to our dive hut with scuba tanks on their backs.

PETER: On snowmobiles? Like divers drove snowmobiles with scuba tanks on their back? That's ludicrous.

PAUL: I thought, that's okay, we're not doing it. But by this time, they'd been really obnoxious and we didn't like them. In fact, Gordon almost bonked one of them later.

GORDON: They said that they wanted to come out and film us diving. I had to point out that we're going in the water, so unless they were coming in with us, they weren't going to see us diving per se. And unless they were Navy certified, we were not going to let them dive with us or in our dive sites. And even if they were certified, we were not going to dive with them. But they wanted to film us going in and coming out of the hole at a minimum.

We agreed with a couple of stipulations. First, you stay the hell out of our way. We'll knock you in the hole if you're in our way. When we toss the tanks over our head to put them on or we turn around with a tank on and it hits you, it could break something and knock you in

the water. If that happens, it's going to be your problem, not ours. Second, don't leave your camera gear anywhere on the floor, especially near the hole when we come back up. We've already broken somebody else's mask this season because they did not heed that warning.

They pretty much stayed out of the way and we didn't get to knock anybody flat with our gear though, of course, it wouldn't have been intentional. We managed to get in the water without too much hassle from the cameraman and director. However, when we were coming out, they weren't quite ready but they had left the door open with an awful wind so that the light would be better. I came out first at the end of a long, deep, and cold dive that included a 10 minute decompression stop under the ice.

PAUL: The hut door was open. The wind was howling through the house so it was cold!

GORDON: I came up and started to get my weight belt and tank off so I could get out of the water. Here is the director in my face saying, "Sorry mate, we were not ready so would you go back down and come up again so we can record it".

I will leave my next five or six words to your imagination but he got the point that there wasn't any way I was going to do that. He needed to get out of my way or he was going to get a weight belt, tanks, and flippers in the middle of his camera.

PAUL: We were cold and our hands didn't work.

PETER: You were in a critical moment, you had to get out.

GORDON: I was coming out this of the hole right now whether he was in the way or not.

PETER: Every dive you stayed to your thermal limit because you were trying to get work done.

GORDON: Right and that meant we were always cold when we got back to the hole. So I just flung the weight belt out and got out. He wanted to be able to get Paul coming up. I told him he better get him the first time, because I'm a nice guy compared to what he'll say and do to you if you ask him to go back down. He got his film and we never saw them again.

PETER: Did the footage ever appear on TV?

PAUL: I saw it in 1968 when I went to my first-ever Scientific Committee for Antarctic Research (SCAR) meeting. When they played it, they introduced it as New Zealand divers because we refused to sign waivers. And here come the two clowns roaring by on the snow machine, with the scuba tanks on. Then there's Gordon looking up, ripping his mask off.

PETER: So you don't know if it ever made it on TV. You just saw it at a SCAR meeting.

PAUL: I don't know if it ever aired. What other things did we want to cover here?

GORDON: Well, another amusing anecdote. Most of the helicopter pilots were a duty rotation that included Viet Nam followed by the Antarctic. This was in the Vietnam War. On one trip we were going out to Cape Evans by helo. We were going to blow holes and all

that, and so we had all the survival gear plus C-4, caps and det cord. This was the very first flight in the Antarctic for this pilot so he was not going to carry explosive and caps on the same trip. There were going to be two separate trips and there was no changing his mind, so a second helo followed us up there.

Anyway, this was his first flight in the Antarctic. He came in and hovered about one inch above the ice where he held it. He told us we could get out here while he hovered. We were trying to tell him put it down on the ice and we'll take our stuff out. Even the crew chief and pilot of the other chopper said put it down on the ice; it's safe. The pilot was adamant that he did not know if it was safe as he had not had the ice thickness checked out and it's a safety issue. It's in their book.

Everybody was trying to tell him that the ice is eight-foot thick and not a problem. Finally, I pointed out that he flew in on a Starlifter (C-141) which is several hundred times heavier than a helo and they landed that on the same ice sheet. What we're asking you to do is put this little helicopter on that same ice. But he didn't. We unloaded that plane while he hovered for about 10 minutes one inch off the ice and in the same place. It was a pain in the ass because the rotor blew so much wind and snow around. As an aside, the other pilot did just land on the ice to drop off the rest of the explosives and miscellaneous gear. We did our dive and the same pilot came back to pick us up. This time, "Boom", right on the ice with no hesitation. Obviously, he had a discussion with somebody who made it clear that, first, this hovering jazz was not safe when unloading civilians and their

gear, and, second, he didn't need to worry about the ice being safe to land on.

PAUL: Let's talk a little bit about the challenges of filling our tanks. We were used to the routine of filling our tanks at Friday Harbor, so we knew about using and maintaining the compressors, main tank bank, filters, etc. At McMurdo we had to do all that and even build and repair the system. The compressor was in the Butler Building where Northstar had all their field support stuff. We would take turns sitting up there after every dive for an hour to two and a half hours to fill our tanks for the next day's dives. We would use four sets of double 72s in a day. I'd be taking notes or writing in my dive logs or something to make use of the time. Occasionally we would make some midnight requisitions of candy bars and other essentials that were otherwise a real pain to get from Northstar in the regular requisition mode. So a good chunk of our life was sitting there with our compressor running. It was okay in that we could sort of relax while the other person was running around getting things ready for the next dive or preserving specimens we collected.

The system worked pretty well. But at the end of the first summer, the compressor was really slowing down because it was just old and over-used. Also, I didn't realize it at first, but we were coming up with our mouth's having a sort of pasty feeling. It turned out that there was oil getting into the compressed air. Predictably, I think I got pneumonia from that oil. Now I knew if I turned myself in at the medical center with pneumonia, I'd be sent home. That would be the end

of the program and Gordon couldn't dive alone, at least not officially. So I was really having trouble. Pneumonia is scary, you can't breathe and you can't lie down. You have to sit up straight because your lungs are full of that stuff.

Gordon just went out and did the things by himself with me occasionally as a tender at the surface. I think you also had somebody else helping you but not diving.

PETER: You weren't changing compressor filters.

PAUL: There weren't any. That was the problem which once again demonstrated how poorly prepared Northstar was to handle support for a diving program.

Then Gordon got a mild form of pneumonia or something similar. I finished the season diving alone. There were not that many dives and it was safe enough except when the plankton bloom came in. I knew where the hole was from the bottom topography which we knew very well by that time.

But I had trouble on my last dive hitting the hole as I was coming up through the bloom. The plankton bloom reduced visibility from a couple of hundred feet to virtually zero just under the ice. I would come up in the brash ice and plankton, feel around for the hole, go back down, and try again. There didn't seem to be much current but there was enough to move me out of location just a little. It took several tries to find the hole so that was our last dive that season.

GORDON: I think I was down there wondering, "Where the hell is he?" It is always scarier to be on the surface tending

than it is to be diving, especially when you know what could be going wrong.

PAUL: Yes, but then we made a big pitch to the NSF to get another compressor and change the filters.

So in the summer as we were ending our program, NSF sent the dive guy from UCLA down to review the compressor situation. He said the filters were pretty old, and these guys are using it without ... blah, blah, blah, So he put on some more filters and declared all well.

Well, when we got there at the beginning of the second season, we started the compressor but the other filters just killed the compressor and blew the valves or a piston ring and it didn't work anymore. So now we're there, in early September on a WinFly and knowing that would be nothing coming in for another month.

It turned out that the fire department had a compressor for filling their self contained breathing apparatus (SCBA) and they volunteered to let us use it. So we'd go over and sit in the fire department every day for about five hours. They weren't that fond of us after awhile with that compressor disturbing what little rest they could get. I think they actually let us take the compressor back over to the Butler Building.

GORDON: Yes, because it wasn't the big compressor like we had so it was much more portable and it was smaller because they fill their little bottles and they did not need to do that very often.

PETER: And you were filling to 1200 or 1600 PSI in

your double 72s or 80s?

GORDON: 3,000 PSI. We would just run them all the way up.

PETER: And the tanks were doubles in four sets, that's why it took so long. It was a lot of air and time to pump it.

PAUL: We didn't want to run out of air.

GORDON: Actually, we were effectively filling about one of the doubles, maybe one and a little bit because we'd come back with those tanks still holding 1200 - 1400 PSI.

PETER: You didn't run them down?

GORDON: We wouldn't even come close on most dives; it was too cold and/or deep to stay long enough.

I did run one down one time in 1984. By that time, we had DUI dry suits. I went into 30 feet of water and spent three and a half hours there. I essentially emptied the tanks to about 400-500PSI because time was not a limiting factor and cold was much less of a problem in those suits.

I did have another instance of emptying a tank, largely due to my own negligence. As background, Jimmy Stewart had told us in the beginning of the program that if we had any problem and you have to dump your weight belt, "DUMP IT!" He did not want us to be like many of the casualties he had seen where he found the body and they still have on their weight belt. His mantra was "Dump your weight belt and I'll get it for you or get you another one".

Well, I ran out of air one time in 1974 at about a hundred

feet on a dive near Turtle Rock. As we drove there from McMurdo, my tank was bouncing around in the back of the pickup and I think the valve cracked open slightly. Most of the air was gone but there was still enough to start the dive. I didn't know that it was low though because that's probably the only time in my career I didn't check my pressure gauge.

PETER: Before the start of the dive

GORDON: Right. So a few minutes into the dive I thought, "Man this tank sucks hard." Well, there was a reason for that which became obvious as soon as I looked at the pressure gauge! Anyway I dumped my weight belt and ascended fast, blowing air the whole way from my Unisuit and my lungs. I came shooting through the hole with Jimmy standing right there. I almost hit him in the face. After I quit bouncing around, I told him, "Remember you said if I dumped a weight belt, you'd go get it. Well, my weight belt is down there." God bless him, Jimmy put on his gear and went and got my weight belt.

PAUL: Maybe I could talk about the value to our diving program of my wintering over in 1963-64 and learning how to scour and scrounge, and take care of ourselves, and then you could augment it. Most of the scientists knew how to take care of themselves and they did not have to depend on the support people. All the support was provided at cost plus and thus a financial benefit for the contractor. They would have even bathed you if you let them, because that meant they would have to hire six, seven, or eight more people to bathe scientists and then they got cost plus on all of that. Eventually they successfully

forced the scientists to be utterly dependent on their super expensive support.

When I wintered over in 1963, it was back in the era that John Dearborn and Jack Littlepage and those guys were talking about when the Navy basically ignored us. They told us to stay out of the dump, but they had a weasel (a small tracked vehicle) with tracks the same size as we used on our Polecat. Art DeVries and I went down to the dump and he showed me how to get a track off the weasel, and nobody cared. I used at least one on the Polecat that winter and we used the other one the next summer. It was important to anticipate things and not worry about stupid rules about not going into the dump. Also when I figured out how to do the blasting in the middle of the winter, I went up to the isolated building and just took the dynamite, caps and fuse, and took them way out on the ice where I learned and practiced blowing holes in the ice. As a 7-8 year old, I had watched loggers blow stumps. I knew how to get the cap into the dynamite and run the fuse into the cap and use more sticks of dynamite. Figuring out how to apply that technique to ice on my own saved God knows how many miserable days of chain saw cutting! The point is we became self-reliant. If we wanted something done, we did it ourselves, especially when we ran into resistance from the support folks, whether it was the USN, Northstar, Stanford, or later contractors. When the chain saw broke, I figured that it's a simple engine so I sat there and broke it down, figured out how it worked, and fixed it.

We had to be prepared to be totally self-reliant and I

think that helped when we came back. When bad things happened, I would not wring my hands and complain, and send electronic teletypes [this was in the days long before the Internet or satellite telephones] and beg or rant for this or that. In the meantime, we would go looking around to see where we could find a compressor (the fire hall), how to deal with immersion heaters to keep the holes open wide enough, or “midnight requisition” enough steaks and other goodies so we could eat in the fish house.

PETER: Coming back refers to what season?

PAUL: I was there for 15 months in 1963 and 1964. And then we came back in 1967. Gordon, what was your impression.

GORDON: I would second that it was very useful experience in just learning how to fend for yourself. For most of us in graduate school, there wasn't a course in self-reliance in the field. You either learned or you don't learn that, but you learned it on your own. The place you learned it was programs like this where, you can't go to the local Home Depot to get whatever it is you needed. You have to figure out where you're going to find it in this place. In a place as big as McMurdo, it was probably there somewhere; it was just a matter of finding it. I'll have to say that my relationship with a lot of the Navy folks was a whole lot better than it was with the Northstar for the most part. Many, though not all, the Navy folks really wanted to help. As far as they were concerned, we were a great diversion if they could help us. It meant they didn't have to do their normal routine job for a day or whatever it took to help us and they were quite happy to break the

boredom.

So when I went looking for something, very often they would tell me, “Well, it's here or why don't you go over and talk to the guys in the maintenance department or go over to the photo lab. Somebody will have it.” I got my camera fixed half a dozen times down at the photo lab. Those guys were great.

The SeaBees (Navy Construction Battalion) could be helpful when they wanted to be. For example, when I got there in 1974 in charge of the program while Paul was home teaching, Paul told me that that they stored fish houses (or dive huts) near the SeaBee building. He told me we need two or three of those on the Ice at specific locations, so go get it done. I went over to the SeaBee building to talk with the lieutenant commander who was in charge. He was on the same plane as I was coming in so he didn't know anything about what was going on in his unit at McMurdo. So he said, “Go talk to the chief [petty officer who is really in charge] and make sure you mention a bottle of whiskey in there somewhere”. I found the chief and told him that we needed three of these fish houses just like that one out behind the shop here and there was a bottle of whiskey in it somewhere. He wanted to know when we needed them. “Oh, sometime in the next few days, because we have to get stuff together.” That was about 3 o'clock in the afternoon. The next morning or possibly two days later, he's behind me in the mess hall, taps me on the shoulder and says, “Your fish house is ready.”

GORDON: Okay. I went out there and looked and by God, those SeaBees had a fish house in one night, brightly painted and

good as new and the rest over the next couple of days. The chief got three bottles of whiskey. I wouldn't have drunk that whiskey. That stuff was awful.

We had the SeaBees do a number of things like that. We asked them to clear snow from an area at Winter Quarters Bay. We wanted the four foot snow cover removed from an area about 100' X 100' so the light would get through, and we could see to dive without lights. The next morning we came to Winter Quarters Bay to an amazing sight. The SeaBee with his D-8 bulldozer ended up being out there all night and he'd cleared at least a football field. He didn't have anything else to do or it was better than anything else he was scheduled to do.

PETER: You had a lot of light underwater as a result.

GORDON: Man, did we ever! We also had a snow berm 15 - 20 feet high all the way around the fish house. That turned out to be a bit of a problem because that much snow is heavy when piled up in a berm. It pushes the ice down so the water comes up through the top of the hole and cracks in the ice and runs under the fish house. Then it freezes so that the 12" X 12" runners for the fish house (which is essentially a house on a sled) are frozen into the ice and they don't break out easily.

PAUL: You have to chain saw them out – it takes all day.

I would like to get back to the science which was why we were there. I talked earlier about the question for ecological “stability” which at the time was a popular concept in ecology. Based on my

previous experience at McMurdo from just looking down to the bottom through the holes, I had the idea that this was a habitat that was structured around biological interactions rather than physical forces. One of the first things we saw was the biological zonation. From the shore to about 20-30 foot depth, the bottom was a sheet of ice or bare rock or gravel. The next 20 feet or so had ephemeral animals or starfish, and from 40 to about 60 foot depth, there was *Clavularia*, a small stoloniferan, and more hydroids and other cnidarians (sea anemones). The density of these species increased to a depth of about 100 feet or about 30 meters. Relatively suddenly at that depth many species of sponges, some very large, show up sitting on a mat of sponge spicules – in a few deep areas the spicule matt was half a meter thick. We speculated and later demonstrated that the zonation was caused by a decrease in the amount of anchor ice as depth increases and the anchor ice stops at about 30 meters. The anchor ice forms on the ground and, when it gets to a mass that has more buoyancy than the weight of the rocks or whatever organisms are holding it down, the anchor ice mat with any critters in the ice crystal matrix floats up to the underside of the ice sheet. That's a disturbance that's not predictable in a short time/space scale, but is predictable in the longer term; hence the zonation. And we saw this occur all the time, so there really was no doubt about the importance of this disturbance. I now know that this zonation related to anchor ice formation is common around the Antarctic continent

This sort of wrecked my reason for working in the Antarctic. Remember that my idea was that the marine habitat was

extremely stable and predictable but now we see overwhelming anchor ice disturbance that is not predictable and varies in intensity along the depth gradient to 30 meters. It was apparent that the stable area started at around 30 meters depth.

That's why we had to work deep. I really did want to focus on that physically stable zone, where there wasn't this unpredictable anchor ice disturbance. Also, the dominance of sponges rather than fish and polychaetes made me realize we needed to change the focus to working with the sponges and the community variables that influenced them.

The other day, we talked about John Dearborn going down all by himself, getting off the plane, and seeing only white snow and ice. He was trying to do a thesis in a habitat that had last been sampled by the British 50 years before John got there. But nobody, including the British naturalists, had ever looked at any biological relationships. They just collected samples through the ice using grabs and dredges, took them home as preserved specimen and sent them off to different specialists to be identified taxonomically.

Dearborn had to sample all over the place with his grabs by himself, which I think is really just a tremendously remarkable bit of hard work for a single person. But still, there's no way he could identify any real ecological relationships because he was still relying on a grab dropped blindly to bring up his samples. It was a huge effort and I very deeply respect him, but the ecology he could do was to pick the samples and describe what he collected with regard to depth, location, time, etc.

So his thesis has maps of sponge spicule mat which was really what he was sampling along with some star fish, anemones, some sponges, and other critters. He didn't have many of the huge sponges or many of the other epifauna that were large and sometimes in low density. These were the critters that we saw as soon as we got in.

When we first went down to their depth, our reactions were “My God, it's a forest of sponges, and they're beautiful colors and shapes and there a lot of them and they are probably all different species and WOW!!!” Neither of us had ever worked with sponges before. We didn't know anything about sponges. We didn't know the names of starfish although Dearborn helped immediately. We knew almost nothing about the taxonomy of the sponge food web. John Dearborn had given me almost 100 slides of animals from his thesis work, but he was looking at the small animals in the sponge spicule mat rather than the big ones we were looking at. For this reason we ended up giving the sponges descriptive common names based on some obvious feature; basketball sponge, volcano sponge, finger sponge, staghorn sponge, red or green sponge. These names allowed us to collect data and leave the taxonomic work until later.

We had a good idea of the starfish names from Dearborn, but we did make a mistake with the *Perknaster*. It turned out that the mistake was a good one because I split it into two species and it turned out they were the same species. I learned from the mistake.

Almost everything else was an unknown species and even genus or family in most cases. It's really frustrating when you just

don't know what you're doing and you're still trying to study all these ecological interactions of competition, feeding behavior, predation rates, growth rates, etc. We thought we were going to be able to detect and measure all these growth rates and we didn't. We quickly realized the bad news was that we knew nothing about the ecological relationships of the benthic community we were immersed in, but the good news was that no one else did either and we were going to be the pioneers in this effort if we could just ask the right questions and collect the right data.

It was the first year that Cadet Hand, a sea anemone expert from Bodega Marine Lab in California, came down to McMurdo as a VIP. He was going to be able to go to South Pole Station and have all these boondoggles. But when he stopped in the BioLab to see what we were doing and found us with all these sea anemones and hydroids that we could not even begin to identify, he just got right into what we were doing and basically he never left our lab until he went home. Some of the great wisdom of George Llano came to play early in our efforts to identify the species we worked with. George had spent a great deal of effort and money to buy complete sets of the Discovery Reports and Terra Nova Expedition Reports for McMurdo. These many volumes included the original descriptions of many of the animals we had to identify. With the limited library we had, Cadet identified most of the anemones and hydroids that I probably would never have learned. His visit was serendipity and it made a big difference to us.

We did okay in the long term because we eventually got names for the animals from experts all over the world. But while we

were there, we didn't know the scientific names and we just used these colloquial names. Just another example of learning to improvise in the pursuit of science.

GORDON: We didn't make too many taxonomic errors by lumping or splitting species. At least for the significant sponges, starfish, and all sorts of things, our names held up pretty well and could be matched with the correct scientific names later provided by the experts.

PETER: Names you used in publications were in line with the Antarctic scientific expedition reports and it's obvious that you had researched them. Some of those names were found in reference material in the library there, from my understanding.

PAUL: Well, we had all the Discovery and Terra Nova reports as well as the Libbie Hyman series and numerous other scientific expedition reports. This is the great advantage to having a library, even a small library unlike my own Scripps Institution. But with the sponges, you have to spend a lifetime looking at spicules to identify them and even then there is still controversy amongst the various experts.

We used the old Antarctic expedition reports for other stuff but the pictures they had were usually of preserved specimens and almost useless, and the keys were really hard to use.

There was at least one mistake I made by lumping two really different species as Volcano sponge. When you lump and make an error, you can't always correct it. If you split, which we did with *Perknaster*, then you're okay because the data are originally separated and

can be simply combined. With the *Perknaster*, it was lucky because they looked so different that I argued with Dearborn about it. But he was very stubborn that my two species were just morphs of the same species. The little ones are about maybe six to ten inches in diameter at the most with thin hard little arms. We knew they would eat everything, because we were keeping track of the diets for all the starfish.

Then there's this great big honker which is about 18 inches in diameter, fat and slimy.

GORDON: Ugly!

PAUL: Yes. They really look like different starfish with totally different size, shape and feel and it was slimy to boot. However, we had tagged a bunch of starfish of numerous species. This included tagging the little *Perknaster*. One of those little ones that I tagged crawled onto a *Mycale* sponge which is the competitive space-dominant sponge. Once the little tagged *Perknaster* found the *Mycale*, the little *Perknaster* turned into the big *Perknaster* as it switched from having a wide diet to being an absolute specialist eating only the *Mycale* sponge.

That is one of the few cases in the literature even today where you have that nice Type 3 functional response really working well. This refers to a situation in which a generalized predator encountering a common prey item develops a search image and specializes on that prey species. It is important because it serves to “regulate” a prey species that is increasing and possibly taking over the environment, which *Mycale* definitely could do.

So our splitting the taxonomy turned out good because we had separate data sets to define this prey response switch.

PETER: I want to go back a little to learn about how you switched from fish eating worms, to looking at something different. You guys are down there together. Gordon, you're there to help Paul who is there to study fish eating worms. You start out doing that and then switch. Did you guys talk about that a lot? You talked about anchor ice formation forming the benthic structure. Did you come up from dives and discuss things and then you go look at that on the next dive?

GORDON: There was a lot of that discussion in the bathtubs after the dive as we warmed up, at supper, in the lab, at the officers' wardroom, everywhere. A lot of it comes down to how we were each making these observations and more important, how we thought about them. I was generally thinking like a naturalist and observing in the moment. Paul was making observations but combining the naturalist's perspective with his questioning mind and asking, "Why is that so or why is that happening?" So he would often be the one that posed that question or hypothesis, and then there would be a lot of discussion about how to test it. After the dives, sitting in our office; just BSing about what we had done that day, and what was coming out of it and what do we think about that. But I would have to say, even though we were about the same age and same level in graduate school, this was sort of like being in a professor-student relationship. I learned a lot as a student.

PETER: But you applied what you knew from your research in intertidal and subtidal environments and course work, and you

could start trying to construct a picture of what you were seeing?

GORDON: Yes. And we were learning by ourselves. This was a real learning experience *in situ* without any sort of class. We had to figure things out for ourselves or the program would have been a failure. There were very few people at McMurdo that we could use as mentors in marine ecology or ecological processes of any kind. There was very little outside support, especially for that first year even with Cadet Hand and Joel Hedgpeth there.

PAUL: Joel was a very nice gentleman, but not much help to us.

GORDON: He was a distraction because he loved to talk and he was in the next office to ours. Really, it was the two of us. There were other scientists around but there weren't any marine biologists so there wasn't anybody really getting in and doing what we were doing.

PETER: Well, how soon did you realize there were no sessile organisms shallower than 45 feet, and ask why are these big sponges only below a hundred feet? That's not just a prediction from sticking your hand in the water. How did you guys go about re-structuring your program and knowing what to do next?

GORDON: Paul and I had and have a slightly different perspective but several observations came together at the same time. As soon as you get in the water and you look around, you see that in 35 or 40 feet of water or less, there's nothing up there; it's mostly abiotic and all gravel. That was kind of odd because it was apparent from the lack of gouges and trenches in the bottom that the area was not getting scraped

clean by moving broken sea ice. There were no big scour marks or anything such as I later observed at Prudhoe Bay in the Arctic.

So, we asked ourselves, “Where is that barren area coming from?” Not very long after that, we noticed on the rope hanging down the ladder from our hole in the ice that there was frazzle ice up to a meter in diameter around the top and that it tapered down so that, at about 90 feet (30 meters or so), the rope was bare. Well, that raised another interesting question, “What is causing the ice to form like that?” and “Does that have anything to do with the zonation?”

Then one day I found and photographed a 50 pound steel dredge that one of the scientists had been using down there. But it is not on the bottom where you would expect to find something that heavy. Instead it's frozen into the underside of the sea ice. The anchor ice had formed around it much as we had observed anchor ice forming around sponges and other epibenthos in the shallower areas until the ice buoyancy overcame the weight of the dredge whereupon the ice lifted it up from the bottom, and it was frozen into the underside of the ice. We spent a lot of time under the ice shelf looking around, especially during our decompression stop, and we noticed that there were little bits of sponge, starfish, sea urchins and other critters frozen into the underside of the ice sheet. How did they get there? They obviously didn't swim!!

So I think all these observations came together when, eventually, we saw a mat anchor ice float up with critters in it. It happened when we were swimming over it, so we probably provided just enough energy to break the ice loose from the bottom. In fact, it scared

the hell out of me when it happened another time in shallow water. The bottom started lifting up. Paul saw the same thing happen in deeper water?

PAUL: Yes. What was happening was pretty obvious.

GORDON: It was pretty clear, yes. Just a further note. As soon as we began to understand this process and the consequences, Paul recalled an article by one of the early explorer/scientists (Frank Debenham and Swithinbank) in the McMurdo region who observed marine benthic invertebrates, especially sponges, on the sea ice surface and well up the slopes of Observation Hill just south of McMurdo Base. They had speculated about how that happened. I don't recall their speculation but it was way off base. The anchor ice phenomenon provided a plausible and likely explanation.

PAUL: It was really the second year when it became very apparent that nothing worked as I had hypothesized in the stable food web. All the cages were exactly as we left them and essentially nothing had changed inside or outside them. That was disappointing. Remember that I had been working with starfish and their predator/prey roles in Washington and Gordon had been working with the nudibranchs and all of their difficult biology – he was a very good observer. We could deal with the predators, food webs, and other cool life-history phenomena. We did that reflexively, because we were doing it so intensively for our dissertations in Washington.

At McMurdo, we were doing much the same kind of

predator/prey inclusion/exclusion caging that I was doing in Washington (and that was the vogue of the day, especially amongst marine intertidal ecologists). In the first year at McMurdo, we were separating the predators from the prey to see how much the prey grew (exclusion cages), or putting predators in with the prey to get feeding rates and growth rates of the predators (inclusion cages). I put brooding starfish in cages so I could see how far the brooding had gone the next year. We did all that the first year with the expectation that we would be describing and measuring community dynamics, population interactions, competition, invasion, and all the wonderful things that a marine ecologist gets excited about.

But when we came back the second year, very little had changed. The one exception was the *Mycale* sponge, which settled on things inside a cage and grew all the way through the cage and over the critters in the cage killing those underneath the *Mycale*.

On the other hand, there were starfish that didn't move for three years. We have pictures showing the same starfish in the same place for extended periods. There was the brooding *Diplasterias* that I had in the cage. I knew from looking at them, that they go through a stage with little eggs to big eggs to baby star fish and this takes brooding for at least three years. I knew that these things were sitting there for three years. But I put one in the cage and it was the early stage (little eggs). I looked at it quite carefully, and it hadn't gone from the little sort of eggs with legs starting to come out into the star fish. They were still little eggs with legs starting to come out looking exactly as it had the year

before.

So those things might sit and not feed for five or six years while brooding their babies.

So when we came back in the second year (1968), we were confronted with a real potential research disaster because it appeared nothing had worked let alone worked as we expected.

PETER: That time scale is not good for producing dissertation research or publications.

PAUL: No. And we both were, at that point, really happy that we had our independent theses that were coming along, so our lives and our careers didn't depend on the results of the Antarctic program. But we were proud, persistent, and stubborn and I really wanted to figure out how that system worked.

Plus, for me, this was the most important challenge of my career; the best sort of field judgment of what to do with a surprise.

The first surprise (or maybe better described as a disappointment) was when the fish didn't eat the worms. Though I expected them to, it was so obvious when they didn't that we knew that line of experiments was not going to work.

But here with the starfish and sponges we could get food web data and that's all we could get. We would have to infer how much the predators eat of those sponges and things.

So at the beginning of the second season, we knew their diets, but nothing else. How could we actually evaluate the community roles of the predators? How much of their prey do they eat per year?

What impact does this have on the prey populations? How can you really understand the integration of a community with diet data? How much can one realistically extract about ecosystem dynamics and functional roles from food webs.

We realized that we had to construct this information by indirect means and ecosystem approaches then being developed by John Teal and others. Fortunately we had read his papers and those of the Odum school so we had a ground work for evaluating their impacts via energetics. But we had no energetic data let alone process information. We need to evaluate the amount of energy channeled into each predator population in a year and relate that to the energy that was available to them. So we needed metabolic rates, growth rates and energy into reproduction that should add up to a rough estimate of the amount of potential energy going through the predator population. I knew how to do respiration rates from my winter with Curly's fish, so I could do respiration rates pretty well. They're hard to do with starfish or anything, because the subject can get "psychotic" and exhibit abnormally high rates. We avoided stressing the asteroids (starfish) by carefully sliding each one separately into a glass jar on the bottom and letting it sit there with the cap screwed on. If we saw them running around in the jar, we didn't use them. We used the ones that were happy to sit there in the jar, and then we analyzed the oxygen with the old Winkler procedures I knew so well from wintering over – indeed, the set ups from 1964 were just where I had left them in the store room, so we moved easily into that. We were lucky with gonad indices because we were there on the WinFly

and the animals had not spawned yet. We were also able to use data that John Pearse had collected. These animals can put a significant amount of potential energy into the lipid rich gonads.

We still had to calculate and convert energy in a population into individual growth rates. In the first year, people had not been successful tagging sea stars, and we had tried using floy tags in Washington but learned that they pull them out. So we were successful using monofilament line going through an asteroid leg with the tag on the line. This worked. And so we had growth rates when returned.

We calculated how much energy the population of each predator was using, but we still needed to regress these data over the data on potential energy available to them from the sponges. This involves a great deal of work collecting and estimating biomass of the prey species from photo transects. For this we needed to calculate the biomass (eventually the calories) of the sponges from linear measurements of sponges as seen in the hundreds of transect photographs. Then, given the diet data, we could calculate the impact for most of the predators on each prey species. Then, this is where Bob Paine showed up and really helped a lot. Bob was my advisor doing a sabbatical in New Zealand and he came down as a VIP. Importantly he was a real expert on calorimetry, and he knew a bunch of problems we were going to run into.

We had to bring up all the sponges and get all the sizes, relying on measurements that we could see in the photographs from a vertical shot above the sponges. We measured that dimension and the weight of actual sponges we collected in the field. This was a guide to

length-weight relationships for sponges that you could measure from photographs. We did this with several other species as well. Thus we had size frequencies of all those species that we felt were critical to the predator-prey energetic model in our study area. Eventually we got the caloric values measured back in Seattle when my wife spent a great deal of time carefully running the machine. Eventually we could integrate all these data and construct via the back doorway what these sea stars were doing to the habitat.

I remember sitting there reading John Teal's paper thinking that this was kind of hard and it was. I don't think anybody has ever done that since. Now ecosystem people don't talk to food web people who don't talk to functional people. I think that paper still stands out in my mind as maybe one of my proudest achievements, and that I think is pretty neat. And I'm proud of it.

GORDON: Well, along with that core science Paul just described, we made a lot of natural history observations that nobody else had done or could have done without *in situ* observations that we could make in a diving program. So anything we discovered was new. Much of the basic natural history and observable ecology of the benthic community around McMurdo Sound was, to a large extent, described initially by the work we were doing. We made a lot of ancillary observations and discoveries. We found a sessile ctenophore that was probably about six inches tall (*Lyrocteis flavopallidus*). We looked at it for a long time and decided it was a cross between a sea anemone and rabbit. There was no other way to describe its appearance, especially as

neither one of us was aware that there was such a thing as a sessile ctenophore.

PAUL: We had a huge fight over it

GORDON: Yes. We had all kinds of hypotheses (beside the anemone-rabbit cross). Finally one day I saw it with the tentacles out and realized those were ctenophore tentacles.

In the BioLab library, I had found the book *The Invertebrates: Protozoa through Ctenophora* by Libby Hyman. She was a renowned Smithsonian biologist who wrote this fabulous collection of books on marine invertebrates. One of them was on ctenophores and there it was -- a description of sessile ctenophores except that all the ones she described were tiny. Here we had this monster. Anyway, we collected several and sent it to a world expert in Japan. Sure enough, he said it was a new species and helped us name it *Lyrocteis flavopallidus*.

PETER: And it has not been found in great numbers since. It's still rare.

PAUL: We collected several.

GORDON: Yes. We were always curious about how they got to our study areas because we had never seen one on the bottom and we had spent a lot of hours looking carefully at the benthic habitat. The first one we saw was on a steel pole that we had put in the ground at about 90 feet for marking something else. We never saw them until then. We assumed that it had moved along the bottom and just crept up the pole so that it was on a high point where it could extend its tentacles to feed in the water column without competition from other filter and suspension

feeders. Unfortunately, when you preserve them they turn into a ball of mush so it's not exciting at all. The pictures are more exciting.

PAUL: It took several tries to preserve this ctenophore. We relaxed it in magnesium chloride, which took a long time, and then we very slowly added formalin to the solution because we found out with the first ones that if we added formalin too fast, the ctenophore “shatters”. We harden it with formalin and then infused it with a special wax around it to keep the ball of mush from breaking up. The type specimen is just this ball of wax. If somebody wants to do additional anatomical studies on it, they will have to cut up the wax and get the fine structure.

So we basically collected hard on the population in the diving depth. However, a couple years ago when we went back with the ROV, we found that there are a fair number of them.

PETER: Deeper?

PAUL: Yes, just below where we collected them in the first years. And they show up in journal literature in different places.

GORDON: I would be surprised if it was a rare species.

PAUL: But that was fun because it was totally new.

Another challenge that we faced. In the first year, we determined that the next year we would need a third person on the team so we had a tender and some diving help. Because in the first year, I had seen bacterial issues that excited me, I really wanted to get a bacteriologist to help me with the bacteriology. So I went to a grad

student at UW who was doing bacteria studies and was familiar enough with scuba diving to be a tender. He agreed and we went through getting him all lined up to come to the Ice the second year. But he flunked his physical at the last minute in the summer because he had what they thought might be an ulcer. Those doctors were really careful. I doubt that he had an ulcer or whatever it was, but my opinion was outweighed by actual MDs, so he couldn't go.

Then at the very last minute, we got another student (Charles "Chuck" Galt) at UW. He was very methodical, he worked slowly, and he turned out to be good at any task assigned to him. You gave him a job and he'd do it. I had Rick, the bacteriologist (with the ulcer!) train Chuck how to do the basics of bacteriological tests and analyses. Chuck helped us with the dives as a tender and also participated in some dives. He was very good at making agar gels. The agar is placed in a Petri dish and the agar has different nutrients mixed in it. You smear the test material on the agar and almost overnight, in normal situations, you get a little stain of bacteria. In two or three days, you get beautiful colors in the smears. The bacteriologists can usually define the species based on the nutrients in the agar and the source of whatever was used to make the smear. At least, that's how they did it in those days. We had all these different types of nutrients so we could look at the different species. Chuck put plates of stained agar in the coldest refrigerator that we had in the BioLab. It was plus 1 (~34°F) rather than minus 2 (~28°F) in the natural marine environment. The bacteria cultures should have grown fast because they're warmer than

ambient, but nothing happened.

Just nothing happened for several weeks! We were looking at them regularly at first, but because nothing was happening, we forgot about them. When we wrapping up to go home, I went to the fridge to clean it up and throw the agar plates away. To my surprise, they had all been growing over the month and a half that I hadn't looked at them. They had the streaks of various bacteria -- just everything was perfect! The anomaly was that the growth should have happened in four days, max, but it took nearly three months.

This set me off on a long period of frustrating work trying to get bacteriology done. We (my later grad students and I) continued to look into the bacteriological issues in this cold water environment and we got part way there in the '80s before my program got cut off. I still regret it because bacteria drive the benthic systems and the Antarctic benthic environment seems to be a very different place from most of those studied in temperate/tropical areas. It would be really good to have had that done well and learned more about the role and dynamics of bacteria in the McMurdo marine system.

Bacteriological studies are hard to do well *in situ* in the Antarctic because you have to go deep where it is too cold to stay long enough to complete the work. Plus the bacteria growth dynamics are too slow. In the '80s, Judi Hanson and I were trying to do these *in situ* studies. We were lying there with syringes and other equipment. We were just freezing because we had to remain motionless so we did not stir stuff up inside the chambers. It worked but they were so slow she did

not believe it and we continued on it the second of a three year grant and finally she was convinced that the slow growth was real. It didn't work but she took a whole year to convince herself that Antarctic bacteria grow that slowly. And they did. And just as we had the third year to collect the definitive data, I was cut out of the Antarctic program for reasons that are still not clear to me, a personal vendetta I believe. The program had become such a logistical nightmare that the only thing I really regret was being robbed of the opportunity to publish those data.

PETER: Did you see dead Weddell seals on the bottom?

GORDON: Yes.

PAUL: In Shackleton's expedition, the crew was stranded at Cape Evans because their ship was forced out to sea with a lot of supplies that they could not unload in time. The shore-bound crew had to lay in a lot of seal meat and blubber. We knew that much just from reading about the various expeditions and the hardships that they endured as well as how they provisioned themselves to survive. When we made our first dive at Cape Evans in 1967, there was a lot of the historical debris on the bottom – cans, metal, whiskey bottles and other bottles, etc. What really stood out were big white blobs all over the place; there were probably 20 or 30 anyway.

We didn't know what they were. I finally went in and picked some of them apart to discover that they were dead seals. The white filamentous stuff was bacteria. At first I thought they were "Shackleton's" seals preserved by the bacteria or at least from that era. Actually the dead seals may have been something killed to feed dog teams

maintained by both the New Zealand and American bases. But in any case they certainly were taking years to decompose; much longer than anyplace else I had ever heard of.

In general what happens with the bacteria decomposing a large object is that aerobic bacteria, often *Beggiatoa*, forms a layer on top which uses oxygen. This outer layer protects a layer of anaerobic bacteria underneath that are killed by oxygen and they are sulfide-producing bacteria. When some animal, like a starfish or sea urchin that normally eats bacteria walks onto that seal and begins to eat the white outer layer of aerobic bacteria, the sulfur underneath is released and it can kill them. So you have this “time bomb” of a slowly-decomposing seal that's protected by aerobic bacteria on the top and the deadly anaerobic ones below.

Eventually John Oliver and I did a bunch of experiments. We got dead seals from several sources including other researchers who were doing physiological experiments and from the Kiwis who fed seal meat to their dogs. We sank these dead seals in different places around our study area. Not much happened. They got covered with white bacteria. Over the several years that I was able to find and re-assess them, they didn't change much. Much later John Oliver reported seeing them in more advanced decomposition, but surely we are looking at several years, perhaps over a decade, for a dead seal to decompose from bacterial action.

GORDON: This was remarkably slower than the same process in the Arctic where large fish carcasses are devoured by

amphipods almost before they hit the bottom. I never saw bacterial mats like we did in the Antarctic.

PETER: The sea stars knew they were unsavory.

PAUL: We could see where the urchins tried to get into the mass of the bacteria, but we could also see that there were urchin tests around. The urchins get in slowly, they rear back and use the tips of their spines to break up the bacteria mat a little bit, and then they move in and eat it. So we'd see a little ring of urchins trying to do that. Then there's a ring of dead sea urchin tests which were the ones that the sulphur gas killed.

PETER: What depth?

PAUL: 140 feet.

GORDON: I've got pictures of one seal that we found at about 70 feet at Hut Point. It was obviously a fresh carcass, likely one that died in the course of the physiological experiments being done by another group or possibly one that was mortally wounded but escaped from the Kiwis who fed the meat to their dogs.

The amphipods got into the carcass and the decomposition of these fresh carcasses was an interesting contrast to the bacterial degradation process that Paul is describing. The differences are likely a little dependent on serendipity; that is who gets there first and establishes dominance if you will. Once the amphipods got there, they clean the carcass right out.

PAUL: In a few days.

GORDON: Yes. So we hypothesized that if the

amphipods don't find and start to scavenge the carcass quickly, maybe the bacteria have a chance to establish the aerobic layer of bacteria over the carcass and prevent further rapid decomposition.

PAUL: That's why we did this work at New Harbor, where we knew that the amphipods that seemed constrained to gravel and spicule habitats were less likely to consume the seal before the bacterial communities could be established.

GORDON: As we are getting to the wrap-up point here, we might provide some perspectives on this 2-year program and how it influenced our futures. For me, there was a real long-term benefit of this program working in a remote, polar marine habitat. It was the first time ever working in polar waters, despite Peter's observation that Paul and I were diving in British Columbia and Washington waters where it is obviously cold (for a southern Californian!). When I left graduate school and got a real job, I started working in the Arctic marine environment a lot. I did a lot of diving at Prudhoe Bay in the Arctic Ocean. The Antarctic experience made me a lot more capable of handling the planning and logistics of a remote diving program. Based on the McMurdo experience, I was able to do many of the same kind of things in the Arctic. At the same time, I realized immediately on the first dive that the Arctic habitat is very different from the Antarctic. The Arctic, at least in the western Beaufort Sea, is a shallow water, muddy environment where the broken sea ice has a lot more effect on the bottom with gouging, scraping and generally impacting the bottom. Physical factors are much more important in the structure of the benthic

community at Prudhoe Bay than they are at McMurdo (though some of this is likely due to the much shallower depths at Prudhoe Bay.). We would see anchor ice sometimes but not very much. The lack of physical stability in the Arctic community creates a flat, muddy plain with some polychaete worms, clams, tube dwelling amphipods and other crustaceans, and not much else. It was one of the most boring shallow water marine benthic communities in the world (in my opinion).

Still, the background of the Antarctic benthic community work helped me a lot to look at the Arctic communities and begin to ask the right questions to learn how it might be impacted by the various projects that were planned. That ability to ask questions about what I was seeing was helped immeasurably by working with Paul at McMurdo and trying to emulate his approach to asking, “Why is that happening and what are the ramifications of it to the rest of the community?” Diving in the Arctic was similar to what we were doing in the Antarctic, just shallower. Logistically, I knew what to do and what kind of equipment was needed.

PAUL: I want to elaborate on a couple of other discoveries or confirmations from work we did in the 1960s. The anchor ice dynamics that Gordon described earlier was described in the anchor ice paper that we wrote. We described how rocks, animals, and other things were lifted up and frozen into the bottom of the sea ice cover. It turned out to be a fairly important paper. People didn't realize that John Pearse had written an earlier letter to the editor of Scientific America about the anchor ice phenomenon. He nailed it because he also had seen

it. But it was one paragraph. I didn't know about John's letter until after we came home and started writing our paper on the anchor ice.

The anchor ice paper describes something that had bedeviled the geologists and glaciologists because they often saw benthic organisms in the ice and did not understand how they got there.

Others had observed these fragile sponges, clams, bryozoans, and all sorts of benthic creatures sitting on top of the ice and not broken. What we saw was how these things are just lifted up. In the scientific, expedition and "popular" literature which went back to Frank Debenham, who was on Scott's expedition and to another fellow named Charles Swithinbank, there is discussion about the presence of these critters but they just said it was the glacier moving across a benthic habitat and just slowly sort of grinding it up to the surface of the sea ice. But the benthic critters, many of which were far too delicate to "ground up" or "pushed along", weren't ground up so it was a problem – the observations did not support the explanation.

When our paper came out, I got a letter from Swithinbank saying, "Finally, this makes sense". That was very satisfying. We made the observations, described the mechanism and resolved a decades-old dilemma - we really did something for Antarctic science!

Another thing that oceanographers know about is the loss of the salt out of sea ice. The sea ice forms by freezing the upper layer of the marine water and, in doing so, some of the salt is retained in the ice; it's salty. For various physical reasons, the salt accumulates in

pockets and it melts its way down. As it does so, it gets more and more salty. This eroding brine melts its way through the bottom of the sea ice. It's really cold brine, because it's been up where the air temperature is really cold and much colder than the seawater.

That cold brine flows down and, when you are underwater, you can see the brine coming down because it is so much denser (i.e., saltier) than the seawater. It immediately freezes the seawater around the flow and makes these wonderful stalactites which we photograph so often.

The stalactites will sometimes hit the bottom and the brine goes along the bottom making an "ice crystal tunnel" that encases the brine. Eventually the brine reaches both temperature and salinity equilibrium with the surrounding seawater and the stalactite disappears. We published a paper on that around 1971.

And it's sort of interesting because the British have publicized it, showing a time lapse video which is a big deal in the media now. And we were all over that.

GORDON: If we had a video camera in 1968, we would have had a lot of great footage of these stalactites growing. I actually saw what Paul described where the brine broke through and I just watched a stalactite form for about ten minutes. That brine is probably -10 to 15°F, maybe colder.

PAUL: We were decompressing so we had time to waste under the ice. So we watched that a lot.

PETER: That's where image technology held you back,

because with film, you were very constrained

GORDON: A lot of the stuff that Paul did with community dynamics, et cetera, based on manual analysis of one black and white photograph after another, would be done a lot more quickly now.

PAUL: And an ROV would also have made the original collection of images a lot more efficient and effective.

GORDON: Yeah. But had to get started somewhere.

PAUL: Can you think of anything else we should talk about? I think we've basically tried here to cover the 1960s. We had some jumps into the 1970s. Much of the more recent stuff is published so I'm not sure it's history. At the very least I want to acknowledge the great leadership and wisdom and integrity of George Llano and John Twiss.

GORDON: My last comment is that, of all the places I've been diving in the world, this has got to be the most incredible. The only drawback was the cold water. But I'd do it again even with that cold. That is, I would if I could!

PAUL: I'd do it in a flash if I could also.